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ASPECTS OF THEMATIC APPERCEPTION TESTING : PARANOID SCHIZOPHRENIA.

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THIS paper embodies an attempt to study paranoid conditions by the use of psychological tests of the "projection" type—here, the Thematic Apperception test (*TAT*) and the Ink-blot test of Rorschach. In giving a standardized projection test to a homogeneous group there is some hope that factors specific to the group may emerge. When the group has a common "mental disease" or psychiatric syndrome, it is possible that the results may throw light on the nature of its psychological processes—and hence, ultimately, on the nature of the disease.

In a previous paper (Valentine and Robin, 1950) we demonstrated a scoring system for the *TAT* which we considered more objective, and on a firmer methodological basis, than some existing methods. This technique has been, first, to give the *TAT* to a control group and analyse the series of responses to each card. The procedure is then repeated with the experimental group, and the proportions of each type of response in every card-series in the control and experimental groups are compared; any differences of proportions are tested for statistical significance. Finally, two experimental groups may be compared.

In this way it was felt that the normal range of responses would be at least approximately ascertained, and further, the specifically different responses of the various psychiatric syndromes could be found. The advantages of the method are, first, that it compares nosological groups against a normal control group; second, it reduces the subjective factor in interpretation; and third,

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it points a way to accurate measurement of trends shown both in diagnostic groups and in the individual case.

Constitution of the Groups.

It may be as well at this point to give the working classification which we used in selecting our test group; also to comment on the control group.

The paranoid reaction must be considered essentially non-specific—that is to say, “paranoid” features can arise as symptoms in various illnesses ranging from delirium tremens to early hebephrenic schizophrenia. The unsatisfactory nature of the concept *paranoid* is appreciated when we consider that it means *like or resembling paranoia*, which in itself can scarcely be considered an entity any longer. It is used as a description of cases which may have nothing in common apart from some tendency to persecutory ideation at one phase or another of the illness. The disparate nature of the schizophrenic psychoses in general has been stressed by a number of authorities (*see* Bruetsch, 1940), and an equally good case can be made out for the paranoid psychoses in particular.

The classification which we have used in selecting cases for this study is as follows:

1. *Symptomatic paranoid reaction*.—Here the paranoid features are secondary to some systemic disturbance. Examples are given by Thompson and Nielsen (1948), and Silverman (1949); other examples are the *formes frustes* seen in developing psychoses of the hebephrenic type.

2. *Paranoid-depressive psychosis*.—The paranoid element is associated with depression here, and may be sufficiently florid to mask the affective component. The illness tends to be benign, and the paranoid features are considered to constitute a component; in a different personality setting they might have been replaced by hypochondriacal delusions or guilt reactions.

3. *Paranoid state*.—This comprises mainly ideas of reference and a tendency to fixed persecutory delusions; insight is variable. It seems doubtful whether Kraepelin's *paranoia vera* is, in fact, an entity to be classed separately from *paranoid state*, and this view appears to be supported by the case-histories described by Rosen and Keine (1949).

4. *Paranoid schizophrenia*.—Classically, the illness is marked by delusions which are “multiple, unsystematized, changeable, usually of the most fantastic and illogical nature and accompanied by hallucinations. . . . This type of schizophrenia runs very much the same course as the other varieties, and ends usually in a state of dementia, characterized by mannerisms, stereotypies, incoherence and a total lack of interest.” (Henderson and Gillespie, 1944.)

So far as *paraphrenia* is concerned, we are in agreement with the view of Strecker *et al.* (1947)—“it is scarcely justifiable to think of paraphrenia as a clinical entity. It is one of the redundancies of Kraepelin's passion for classification, and is allied to the original ‘*Délire chronique à évolution systématique*’ of Magnan.” The term is no longer used in the official American psychiatric classification, and, in addition to the above objections, one finds that different interpretations are attached to it by different people; for

example, to some psychiatrists the distinctive point about *paraphrenia* is consonant emotionality; to others it is the preservation of an outward-going personality. We have therefore included cases that some might diagnose as *paraphrenia* in our *paranoid schizophrenic* group. All these cases were grossly deluded and suffered from auditory hallucinations.

Cases of this type (and indeed all schizophrenic disorders) we feel should be classed according to whether there is interference with abstract thinking, as this appears to constitute an important natural division. The disability is conceived in terms of Goldstein's theory of abstract and concrete thought, and can be tested for in a variety of ways. Concrete thinking is nearly always present in "deteriorated" paranoid schizophrenics, but not necessarily in all chronic cases (Meduna, 1950).

5. *Involucional psychosis, paranoid type.*—The separation of this category from *involucional melancholia*, on one hand, and from *paranoid schizophrenia* on the other, is sometimes a tenuous one. In general, however, there seems to be ample justification for its retention as a separate entity, and it is recognized as such in the American classification.

This, then, was the frame of reference used for diagnostic classification, and all cases were drawn from Class 4—*paranoid schizophrenia*, at varying levels of chronicity. In so far as these figures mean anything, the mean duration of illness was 16.0 ± 13.4 years, and the mean length of hospitalization was 11.0 ± 14.0 years. The group numbered 25 cases.

The control group was made up partly of hospital staff, partly of other volunteers, to a total of 25. The mean ages of the two groups were very close; intelligence was approximately matched also. This was done by (i) measuring the intelligence of the experimental group members by Matrix testing and fitting them into Raven's (1938) classes I–V—superior, definitely above average, average, definitely below average, and defective; (ii) selecting control records so that equal numbers of each class of intelligence were obtained. Finally the groups were adjusted so that each had the same balance of the sexes—12 male and 13 female.

TAT SCORING CATEGORIES.

We have been in the habit of extracting from our TAT protocols certain fairly objective scores in an attempt to formulate a scoring pattern. No finality is claimed for the type of scoring presented, but it does represent one method of arriving at differences between diagnostic groups as demonstrated by their TAT performances.

The scores are set out in Tables I and II, and for purposes of comparison the control scores, and the scores made by the depressed group in our last study, are shown also. Differences between the depressed group and the others must be interpreted with caution; the depressed group was matched against its own control group in our previous study, but it is not directly comparable with the present series.

The scores are the means for each group; and the $\pm$ values (as elsewhere in this paper) are standard deviations, not probable errors. The scores were calculated to two decimal places, but are presented correct to one place.

TABLE I.—*Mean Scores and Standard Deviations for the TAT Time Values.*

Scoring category.	Group.		
	Paranoid.	Control.	Depressed.
Total time (min.)	43.0 ± 10.4	35.2 ± 16.0	30.6 ± 8.4
Mean response-time (sec.)	24.6 ± 11.3	19.0 ± 12.1	16.3 ± 7.2
Sum response-times/total time (percentage)	19.5 ± 9.0	19.9 ± 10.6	14.8 ± 5.5
Range of response-times (sec.) . . .	60.0 ± 35.8	35.9 ± 20.5	25.7 ± 12.0
Ratio longest/shortest response-time .	12.0 ± 8.9	6.6 ± 2.6	8.7 ± 6.2

TABLE II.—*Mean Values and Standard Deviations of Certain TAT Scoring Categories in the Paranoid, Control and Depressed Groups.*

Scoring category.	Group.		
	Paranoid.	Control.	Depressed.
Popular Themes	10.3 ± 6.5	13.9 ± 3.3	12.8 ± 5.7
Superior Themes	0.3 ± 0.7	4.0 ± 3.9	0.3 ± 1.1
Elicited Themes	0.3 ± 0.7	0.1 ± 1.0	0.5 ± 0.8
Identification	1.5 ± 1.8	0.9 ± 0.7	1.8 ± 1.5
Alternative Themes	1.4 ± 1.7	1.2 ± 1.6	0.9 ± 1.0
Unusual or Abnormal Themes	4.0 ± 4.6	1.2 ± 1.9	2.3 ± 1.5
Misperceptions	1.9 ± 1.7	0.3 ± 2.0	2.0 ± 1.6
Description without theme	3.4 ± 2.4	not measured.	
No adequate theme.	6.4 ± 4.2	1.7 ± 2.1	6.3 ± 5.6

Time Values.

The response-time is taken as the interval between the patient's receiving the card and the point where he begins to respond with his thematic reply. The paranoid schizophrenic group showed a median response-time of 21.6 sec. (general mean 24.6 sec.), ranging from 9.1 sec. ± 3.9 sec. to 46.4 sec. ± 32.0 sec. The duration of the illness, or degree of deterioration of the patient, did not seem to correlate in any way with the mean response-time over the 20 cards.

In addition to finding the mean response-time of the patients to the series of cards, we also calculated the mean response-times shown by the series of patients to each card. The cards with the longest response-times were Cards 19, 11 and 15, and those with the shortest response-times, 14, 8 and 1 respectively. The median response-time for the cards was 22.9 sec. (general mean 24.6 sec.), and the range extended from 15.1 sec. ± 14.0 to 34.0 sec. ± 30.8 sec.

It will be seen that in general the response-time of the group of patients to one card closely resembles the response-time of one patient to a group of cards; but the patients show more variability in their individual response-times (i.e. from the general mean) than do the cards.

It is also noted that the paranoid schizophrenic group spend more time on the test than do either of the others; also, their response-times are in every case longer than those of the control or depressed groups (see Fig. 1). Their response-times are most markedly greater than the controls on Cards 13 MF, 15, 19 and 20; and most nearly resembling those of the controls on Cards 14, 12 F, 9 GF and 10. This is rather different from the findings in the depressed group, whose response-times differed from the controls most on Cards 19, 9 GF, 5 and 11, and resembled them most on Cards 4, 7 and 8 GF, and 20.

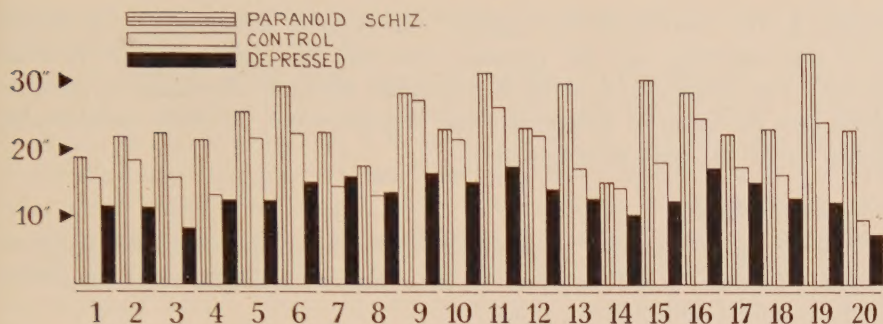


FIG. 1.—Histogram showing the Mean Response-times to each TAT card of the paranoid-schizophrenic, control, and depressed groups.

Although many of the patients in our previous depressed group showed some retardation and difficulty in thinking, it will be noted that their response-times are nearly always shorter than those of the controls. This may be perhaps explained by their failure of imagination—because few alternatives occur to them, they have less hesitation in voicing what thematic material the card does convey to them. This failure of imagination is probably the same thing as the classical symptom of “poverty of ideation.” The normals are more guarded and selective in making their replies, and the paranoid-schizophrenic group more so still. Occasionally the long response-time of the schizophrenic is an outward indication of blocking or preoccupation with hallucinations; this blocking effect on the response-time is most marked, in our experience, in catatonic schizophrenia.

It may be noted that Rosenzweig and Fleming (1949) found a significantly increased response-time for Card 13 MF in a male control group, as contrasted with a normal female group. In our mixed control group, however, we did not find that Card 13 tended to present an abnormally high value. In the other cards our control response-times corresponded fairly closely with those given by Rosenzweig.

The comparatively longer mean response-times of the paranoid-schizophrenic group on Cards 13 MF and 15 seem to indicate they are especially prone to complexes concerning sex and death. This is quite in keeping with the known tendency of these patients to think symbolically and autistically on those subjects. No such specific complexes were suggested by the response-times of the depressed group, who tended to hesitate most on the “difficult” cards, i.e. those presenting most difficulty in interpreting imaginatively.

The response-times of both the paranoid-schizophrenic and depressed groups correlate positively with the controls ($r = +0.69$ and $+0.59$ respectively, both significant at the 0.01 level of confidence), but the paranoid and depressed response-times together show only a non-significant correlation of $+0.40$. This serves to emphasize that although both diagnostic groups show some general similarity to the controls as regards mean response-times, their differences from the control group do not tend to appear on the same cards.

The per cent.-ratio, sum of response-times/total time, is an indication of how much of the total time spent on the test is occupied by response-time hesitation. It will be noted that the paranoid schizophrenic group is very

similar to the controls in this respect ; in terms of actual scores, of course, both the total-time and the response-time sum are greater in the paranoid group. Two scores which assist in estimating blocking, the range of response-times and the ratio of longest/shortest response-time, are both considerably higher in the paranoid schizophrenics.

Thematic Material.

We recognize a number of commonly-occurring stories which we designate *Popular Themes* ; it will be observed that these occur slightly less frequently in the paranoid-schizophrenic group.

Themes which are original, or told in an exceptionally competent manner and brought to an outcome, we call *Superior Themes*. These score low in both groups of patients ; it may be that the production of superior themes calls for some quality of insight which is generally much impaired in psychotic groups.

In our standard technique of presenting the test the subject is given the usual instructions at the start, and then allowed to go ahead without further encouragement to produce material, as we are interested in his *performance in a set situation* rather than in prompting him to produce as much content as possible. However, should he appear to have an idea about a card which he hesitates to express, he is encouraged to do so, and any resulting material is scored as an *Elicited Theme*, because it is not a spontaneous effort. Elicited Themes were scored most commonly in the depressed, where creative imagination, in addition to being reduced, is inhibited. The paranoid-schizophrenic group scored higher than the normals, but not so high as the depressed.

The subject's tendency to *Identification* in his themes is scored when a straightforward self-projection into the story or picture is admitted. This is more common in the paranoid schizophrenics, and the large standard error is due to a number of patients, who are often reminded of themselves or their friends and relatives by the figures in the cards. These patients may incorporate the test into their paranoid systems, and go on to accuse the examiner of having made up the pictures deliberately to taunt them and exploit their anxieties.

Alternative Themes are scored when the subject advances another story or explanation of the situation. This scores quite high in the paranoid group, largely due to the tendency, seen in early cases, to advance several explanations without committing themselves to any.

Attempting to classify the *Unusual or Abnormal Themes* which may occur would take too long, and in any case they are fairly easily recognized. According to our practice, a theme may be classed in this category only, or it may be scored additionally if, for example, an abnormal Alternative Theme is advanced. This type of response is much commoner in the paranoid-schizophrenic group, and more than compensates for the deficiency in Popular Themes found in the group. The significant increase in highly individualized, or Abnormal Themes found in paranoid schizophrenia points to a further difference between this group and the depressions. In depression we found the patients to conform to a pattern more than did the controls—they showed less individual

differences ; but in paranoid schizophrenia the responses are more scattered than those of the control group.

Misperceptions is the term commonly applied to the illusions which crop up in TAT responses, and they are scored when the subject gives indication of distorted apperception. It is important to try to exclude misperceptions due to diminished visual acuity, and if the subject uses reading glasses he should wear them while being tested. Most misperceptions appear to occur as a result of the " mental set " of the subject, and it seems probable that percepts which are emotionally acceptable or concordant are given priority at the apperceptual level. Misperceptions were scored much more commonly in both patient groups than in the controls ; the large standard error is again an indication that high scoring is almost entirely confined to certain patients in the series.

When the subject is able to present *No Adequate Theme*, it is scored as such. Both patient groups scored much higher in this category. It seems likely, however, that the reason for failing cards is not the same in both groups.

At the conclusion of the test we asked the patient whether he particularly liked or disliked any of the cards he saw. We found that Cards 2 and 7 GF were liked most frequently, followed by 1 and, surprisingly enough, 11. The cards most commonly disliked were 12 F and 15, followed by 11, 13 MF and 20. There is insufficient data at the present time to attempt to advance any explanation for this. The almost ambi-equal display of attitudes towards Card 11 seems an interesting point.

RORSCHACH SCORING CATEGORIES.

The scores for the paranoid-schizophrenic patients are set out in Table III, and contrasted with the scores of our previous depressed series and the approximate normal range drawn from several sources (Beck, 1944 ; Rapaport, 1946 ; Sherman and Johnson, 1948). Owing to differences in the scoring technique, reports from different workers are seldom directly comparable.

It will be noticed that the paranoid-schizophrenic group show some increase in mean response-time, also higher scoring for rare detail and white-space responses. Good form is lower, but inner psychic life, as demonstrated by human movement responses, is well maintained. Animal responses are low ; this is ordinarily characteristic of high intelligence, but here it is caused rather by the increase of abnormal responses, as demonstrated by the high value for poor original concepts.

The ratio responses on Plates VIII, IX, X/R is often held to give an indication of extraversion, or attachment to reality ; this ratio is slightly lower in the schizophrenic group. Another method of evaluating the ratio of colour responses is to consider the five so-called chromatic plates, II, III, VIII, IX and X. An attempt was made to discover whether there was any difference in productivity, or response-time, in the chromatic plates as distinct from the non-chromatic. So far as the responses are concerned, these can be expressed as the ratio, number of responses on chromatic plates/number of responses on non-chromatic plates. The mean ratio for the group was found to be

TABLE III.—Mean Values and Standard Deviations for Rorschach Scoring Categories in the Paranoid-Schizophrenic and Depressed Groups, with Approximate Normal Range.

Category.	Group.		
	Paranoid-schizophrenic.	Approximate normal range.	Depressed.
R	21.9±11.9	30.4±15.9	19.3±13.9
T (min.)	25.9±11.0	Variable	18.1±10.5
T/R (sec.)	73.3±24.4	"	80.9±41.1
Mean R-T (sec.)	28.0±13.2	About 20 sec.	19.3±15.3
VIII, IX, X/R%	29.1±9.3	29%	36.8±10.5
W%	45.0±29.72	25-30%	43.0±23.6
D%	46.1±25.25	60-70%	54.2±21.1
Dr%	8.9±10.4	5-10%	2.8±4.5
s	1.8±2.5	1-2	0.9±1.2
F%	68.4±18.5	About 50%	67.3±13.8
F+%.	63.4±28.5	80%	73.3±23.2
Sum C	1.6±1.6	About 3.5	1.6±2.1
H%	14.7±14.7	About 20%	7.1±8.2
A%	30.5±19.6	46.9±17.6	52.3±19.3
P	3.0±1.9	4-9	3.7±2.0
O+	1.2±1.2	Several	1.3±2.3
O-	2.8±3.0	None	0.7±1.4
M	1.9±1.8	Variable	0.5±0.7
FM	0.7±0.9	"	1.5±1.5
Fm	0.2±0.5	Infrequent	0.3±1.0
Fc	0.9±1.2	"	0.8±1.2
FK	0.5±0.7	"	0.5±0.9
C'	0.3±0.8	Rare	0.2±0.4

1.13:1 (median also 1.13:1), indicating that the group of patients did tend to produce rather more responses on the chromatic plates.

Similarly, the ratio response-time on chromatic plates/response-time on non-chromatic plates gave a mean result of 1.36:1 (median 1.09:1). Summing up, one may say that, first, the association between a higher number of responses and a longer response-time is found in the chromatic plates in addition to being present in the series as a whole; and second, there is some evidence that the patients tended to hesitate more, and produce more responses, on the chromatic plates.

In the last paragraph it was mentioned that there is some general association between the number of responses and the response-time. In point of fact, the means for these values on each plate showed a rank-difference correlation of +0.52; *this seems to indicate that the patient's hesitation may often be caused by his sorting out and organizing a number of impressions received from the plate.* The fact that the correlation is relatively imperfect is an indication that in other instances the hesitation may be due to blocking or some other non-productive mental mechanism.

Regarding responses per plate, the general mean was 2.23 ± 0.47 . Most responses were given on Plates X and II, which both averaged 3.0; fewest responses were given on Plates V, VI and VII (means 1.6, 1.7, 1.7). These differences are significant at the 0.05 level. Plate X also had the longest mean response-time (33.4 sec.), and the shortest was on Plate III (20.2 sec.); this difference is significant at the 0.01 level.

CORRELATIONS.

A number of linear correlations were carried out in an attempt to find associations between the various factors concerned. Two items should be noted before we go on to consider these.

First, the *TAT* Themes were awarded arbitrary marks of 2, 3, 1 and 2 for popular, superior, elicited and alternative responses respectively. On this basis the mean score for themes (paranoid-schizophrenic group) was 23.24 ± 12.49 .

The second point is that correlations of less than 0.40 are not statistically significant for the degrees of freedom used in this series of cases.

It was noted that the themes tended to decrease with the age of the subject more markedly than they decreased with the duration of the illness; the length of illness, however, was associated with an increase in abnormal thematic material, as was the duration of hospitalization. There was no correlation between normal themes and duration of hospitalization.

Themes tended to decrease in subjects who took an unusually long time over the test, but they showed no firm connection with the mean response-times. The normal run of themes diminished as abnormal themes increased, and also diminished in the presence of blocking; blocking was related to abnormal themes.

The production of normal *TAT* themes was not correlated with the duration of hospitalization, but it did tend to diminish in the face of an increase of abnormal thematic material; and this abnormal thematic production increases with the duration of hospitalization. *This seems to argue that these patients tend to retain a certain capacity for adjustment, even although their autisms are increasing.*

Considering the Rorschach test, the total time was strongly associated with the time spent on the *TAT*; this correlation was positive in the depressed series also, but much weaker. The response-times of the two tests also correlated; themes and Rorschach responses showed no marked correlation numerically. One might have expected *TAT* Abnormal Themes to correlate positively with Rorschach O — (poor original) responses, and negatively with Rorschach P (popular) responses; but in fact no such correlations were found. However, one does find some slight connection between *TAT* Popular Themes and Rorschach popular responses; and *TAT* themes show a faint association with Rorschach M (human movement) responses and the Colour Sum. The Rorschach H (human) responses correlated very slightly with themes, and A (animal) responses showed a similar slight negative correlation. Rorschach "Good Form" (F + per cent.) showed little association with themes as contrasted with the firm correlation found in the depressive group between these factors. Rorschach rare detail percentage showed a weak association with themes similar to the findings in the depressed; similarly, there was again a negative correlation between Rorschach "Good Form" responses and misperceptions, and a weak positive connection between Alternative Themes and the number of Rorschach responses. Identification on the *TAT* showed a slight association with Rorschach human responses, but none with the Ro-

schach Colour Sum. Good original Rorschach responses (O +) showed no association with *TAT* Alternative Themes, but poor original concepts (O -) correlated with *TAT* Misperceptions; this last was not found in the depressive series. Age showed no correlation with the number of Rorschach responses, nor was the number of responses associated with duration of hospitalization.

The coefficients of correlation for those values are set out in Table IV.

TABLE IV.—*Coefficients of Correlation (r) for a Number of Scoring Categories.*

		<i>r.</i>
<i>TAT</i> Themes	& Age of subject	-.42
	& Duration of illness	-.23
	& Duration of hospitalization	-.07
	& <i>TAT</i> total time	-.44
	& <i>TAT</i> mean response-time	-.11
	& <i>TAT</i> range of response-times	-.39
	& <i>TAT</i> Abnormal Themes	-.29
	& No. of Rorschach responses	+.28
	& Rorschach Rare Detail	+.25
	& Rorschach Human Movement	+.38
	& Rorschach Colour Sum	+.27
	& Rorschach Human Responses	+.19
	& Rorschach Animal Responses	-.20
	& Rorschach "Good Form" Responses	+.11
<i>TAT</i> Abnormal Themes	& Duration of illness	+.28
	& Duration of hospitalization	+.44
	& <i>TAT</i> range of response-times	+.55
	& Rorschach popular responses	+.03
	& Rorschach poor original responses	-.06
<i>TAT</i> Alternative Themes	& No. of Rorschach responses	+.31
	& Rorschach good original responses	+.13
<i>TAT</i> Misperceptions	& Rorschach poor original responses	+.63
	& Rorschach "good form" responses	-.35
<i>TAT</i> Identification	& Rorschach Human Responses	+.23
	& Rorschach Colour Sum	+.00
<i>TAT</i> Popular Themes	& Rorschach popular responses	+.25
Rorschach No. of Responses	& Age of subject	-.07
	& Duration of hospitalization	+.17
Rorschach Total Time	& <i>TAT</i> total time	+.90
Rorschach Mean Response-time	& <i>TAT</i> mean response-time	+.56

ANALYSIS OF THE *TAT* CARDS.

In this section of the paper we return to the comparison-analysis method of investigating groups by the *TAT*. Each card is analysed under headings suggested by the control responses, and the paranoid-schizophrenic group responses are then perused to discover how they compare with the controls. The results have been expressed in percentages; where alternative responses are being considered, they are given only half the weighting of the main response.

When significant differences are being sought between the two groups, the method used is the standard error of the difference between two proportions. The standard error is corrected ($\sqrt{n/(n-1)}$), and the critical ratio or *t*-score is referred to a table of *t* with $(n_1 - 1) + (n_2 - 1) = 48$ degrees of freedom.

These are precautions against attributing significance where none may be present, owing to the relatively small size of the groups. *Significant differences from the control group are indicated by one, two or three asterisks for the 0.05, 0.02 and 0.01 levels of confidence respectively.* Thus, at the 0.01 level the odds are 99:1 against a greater difference occurring in either direction due to the effects of chance. However, if we were to assume that the control responses are in the *correct* direction, we would then be concerned only with whether the given difference or a greater positive one is likely to occur by chance. This more lenient view would admit as significant many differences which are not so recognized here: for example, a difference of 11 per cent. from zero would then be considered significant at the 0.05 level.

	Group.		
	Control.	Paranoid schizo- phrenic.	Signifi- cance.
CARD 1.			
The figure: A boy	100	96	
A man	—	4	
Unusual descriptive comment on the boy	—	28	***
He is compelled to practise	32	8	*
He is lazy	—	12	
The boy's drive: Ambition	46	32	
Uncertainty expressed about it	30	28	
No opinion	24	40	
The violin: A special violin, Stradivarius, gift, etc.	44	4	***
Mentioned, but no special comment	40	48	
The violin is damaged	8	36	**
Violin not mentioned	8	12	
The boy's mood: Depressed	16	12	
Aggressive	8	4	
Not mentioned	76	84	
Outcome: Success	28	28	
Failure	16	12	
No opinion	56	60	
Background comments	8	16	
CARD 2.			
Family group	56	20	**
Woman on right: Pregnant	28	4	*
Praying	8	—	
Depressed	16	—	*
The women are rivals	4	—	
Contrast between desire for education and the farming background	68	44	
Setting: Poor farm land	24	—	**
E. European	8	—	
Egyptian	—	2	
Biblical	—	20	**
The man is ploughing	28	26	
sowing	8	6	
It is a poster	8	—	
CARD 3 GF.			
The girl is depressed	76	56	
She is ill	4	8	
She is ashamed	8	—	
Cause of the trouble: A death	30	14	
Somebody's illness	20	4	
Family matters	16	10	
Quarrel or conflict	34	12	
Outcome—recovery	52	—	***
Background—the door is closed	8	36	**

	Group.		
	Control.	Paranoid schizo- phrenic.	Signifi- cance.
CARD 4.			
The girl is restraining him	49	30	
The man rejects her	28	8	
He is a bad character	16	10	
He is ill	—	8	
The girl is foreign	—	16	*
Background figure said to be a picture	16	20	
a woman	16	12	
implied that it is a woman	36	2	***
CARD 5.			
She is checking the room	12	12	
Her mood is worried	26	16	
cheerful	12	—	
aggressive	18	4	
Other people imagined to be in the room	60	40	
Background comments	36	36	
Doubt about sex of figure	—	8	
CARD 6 GF.			
The girl is startled	48	40	
She is pregnant	4	4	
The man's attitude is friendly	44	16	*
aggressive	12	12	
The man is married	12	—	
proposing to her	8	—	
asking her out	12	12	
he is a CID man	4	—	
They are arguing about money	8	—	
He is telling her something startling	4	4	
Relationship: Husband and wife	20	20	
Father and daughter	8	8	
Mother and son	—	4	
Background comments	—	32	***
Girl taken to be a man	—	4	
CARD 7 GF.			
Relationship: Mother and daughter	84	58	*
Aunt and niece	12	—	
Lady and a girl	4	12	
Maid and a girl	—	6	
Sisters	—	4	
The doll: Mentioned	56	54	
Broken	8	4	
A favourite	4	—	
It is a baby	8	6	
It is the girl's baby	4	2	
The girl is reflecting	20	12	
She is unhappy	28	4	**
Wants to do something else	16	8	
The woman is reading to the girl	40	20	
giving her advice	16	24	
telling her the "facts of life"	8	6	
CARD 8 GF.			
The figure: A model	20	12	
A domestic	12	4	
She is depressed	36	12	*
anxious about something	12	—	
day-dreaming	48	48	
shows vitality	12	4	
she is ill	4	—	
Has a masculine type of strength	—	8	

	Group.		
	Control.	Paranoid schizo- phrenic.	Signifi- cance.
CARD 9 GF			
Relationship : Sisters	20	4	
Mother and daughter	4	4	
Rivals	26	8	
Enemies	12	4	
They are alarmed by a wreck or accident	20	6	
Playing a game	6	—	
The upper girl is watching	40	40	
She wants to help	8	8	
The lower girl is in danger	28	16	
She is suiciding	—	6	
Anxiety is mentioned	28	24	
implied	28	16	
CARD 10.			
The figures : Man and woman	86	60	*
Two men	14	24	
Mother and son	14	12	
Father and son	—	4	
Father and daughter	4	—	
Two homosexuals	4	—	
Theme of contentment	80	60	
aggression	8	—	
They are whispering secrets	—	12	
CARD 11.			
Card rejected	16	8	
The dragon is chasing the man	18	—	*
chasing the animal	10	8	
called some innocuous creature	8	8	
not mentioned	20	32	
The man is mentioned	32	12	
The animal is mentioned	36	40	
CARD 12 F.			
The elderly figure : An unpleasant old woman	52	24	*
A man	—	10	
Doubt as to sex	—	20	**
She is a nun	12	20	
a witch	20	4	
a gipsy	8	—	
The girl is the daughter	12	8	
She is anxious	20	—	**
She is looking at someone	28	20	
She is imagining a future picture of herself	8	12	
CARD 13 MF.			
A seduction scene	26	—	***
Murder or rape	40	16	
The girl is ill or dying	30	46	
She is asleep	10	14	
Alternative themes given	56	64	
CARD 14.			
The figure is masculine	98	96	
It is light outside	40	60	
daylight	24	18	
dawn	12	12	
moonlight	16	14	
It is dark outside	28	12	
He can't sleep	4	—	
He is a burglar	8	—	
He is thinking of suicide	16	4	
Alternative themes given	32	24	

	Group.		
	Control.	Paranoid schizo- phrenic.	Signifi- cance.
CARD 15.			
The figure is an actual person (body-snatcher, dying man, madman, miser, etc.)	52	22	*
A ghost, or unreal	20	16	
Male sex	98	92	
He is visiting a grave	52	46	
thinking of life's futility	8	—	
repenting	8	8	
CARD 16.			
The subject related to self	—	6	
family	10	18	
other persons	8	12	
personal interests	42	24	
No response	4	4	
CARD 17 GF.			
The figure on the bridge: Female	96	98	
Waiting for her husband or lover	36	8	**
Looking at the water	16	20	
She is suiciding	8	4	
She is escaping	4	4	
She is anxious	16	4	
A smuggling scene	24	4	*
A stage set	8	—	
CARD 18 GF.			
Relationship: Family	64	56	
Both same sex	62	60	
Opposite sex	2	20	*
The upper figure is throttling the other	28	8	
chastizing the other	18	26	
comforting the other	22	38	
The lower figure is ill or injured	32	12	
No opinion	—	16	*
CARD 19.			
A house	62	56	
It looks snug	16	4	
Other responses	10	20	
It is snowing	48	56	
stormy	32	8	*
Described as "futuristic," "modernistic," etc.	48	12	***
CARD 20.			
The figure: Male	66	46	
Female	18	30	
Someone	8	12	
Don't know	8	12	
Depressed	32	—	***
Unemployed	12	—	
Waiting for a bus	—	10	
In uniform	20	36	
A woman in uniform	—	8	
A gangster	16	—	
A prostitute	2	—	
Background: Fog	20	12	
Prison camp, barbed wire	8	24	

DISCUSSION.

Some work was done by Harrison (1943) on typical *TAT* response patterns in the various diagnostic groups. He mentions the following schizophrenic indicators :

" . . . improbable stories, incoherence and confusion, absurdities and bizarre elements, poor originality in interpretation, neologisms and strange modes of expression, circumstantiality, affectless story tone, ambitendency in story trend, delusional material in the content, and perseveration of words, phrases and ideas. Less frequently encountered are punning, irrelevant soliloquies by the characters, disruption of obvious relationship in the pictures, and dictation of punctuation, paragraphing and spelling."

He is careful to point out, however, that these findings cannot be considered more than tentative generalizations, and he is of course referring to schizophrenic subjects, not the paranoid group only. From a broader psychological viewpoint Shakow (1946) writes of the paranoid-schizophrenic group :

" The paranoid subject resembles the normal much more than does the hebephrenic subject. Although he is quite rigid in his response, he is sufficiently preserved intellectually and has sufficient ' pride ' to protect his personality against the inroads of the environment . . . the disturbance is primarily at the capacity level (i.e. ' the upper limits of functional ability under ordinary day-to-day conditions '). . . The psychological functions most likely to be disturbed at this level of deterioration are conceptual thinking, immediate recall, speed of self-initiated movement."

Our own findings may be summarized as follows :

1. *Mannerisms of speech and pronunciation.*—There may be muttering, or formalized mispronunciations, leading to difficulty in hearing and comprehending their speech. One subject, for example, tended to distort words, as saying " oopera " and " Mephistopheeles." In spite of apparent superficial inconsistencies, one generally finds that these mannerisms are justified by the patient's system.

2. *Patients' unwillingness to commit themselves to a definite course in their replies.*—This was noted in cases where the illness was in an early stage of development. On the *TAT*, for instance, they tended to give a number of simple alternative explanations, or rather mundane possibilities, which did not possess much in the way of real thematic difference.

3. *Perseveration or stereotypy.*—This was marked, and seemed to be complex-determined by a nuclear focus. It is apt to carry through the *TAT*, the patient's individual complex being introduced into all kinds of situations in an unreasonable and unwarrantable manner. In the Rorschach test, also, the individual shows stereotypy of his theme throughout most of the plates, introducing it at every conceivable opportunity. Where there is no obvious opportunity, one may be made by means of distortions—poorly-seen forms, poor original concepts, etc. One of our most deteriorated patients had 11 Rorschach responses, all perseverations of the first gestalt, " an insect." The perseveration is also seen in early cases, although the departure from normal thinking is much less marked.

4. *Concretization of thought.*—This is shown by a number of factors. For example, the patients frequently believe that the blots represent something, in spite of repeated assurances that they do not. Also, autisms are common. An example of this is a response to Plate VIII—"Blood-ruined, isn't it?" On investigation, the patient said that she experienced pains in her thighs at her period times, but had no period; and she believed that a physician was influencing her menstruation by television and turning the blood into her intestines—hence "blood-ruined."

5. *Involved and fantastic thinking*, which, however, is not completely autistic, may be met with in better-preserved cases. Examples of this from the Rorschach are the following:

Plate V.—A girl dressed as a rabbit which is dressed as a moth.

Plate IX.—Two girls, each thinking the other looks like a donkey.

6. *Symbolic thinking*, where the subject projects sexual symbolism on to the artist but denies it in himself, is neatly shown by the following example:

Plate VI.—The labial folds of the female, but he didn't want to make an anatomical picture, so he made a narrow opening in a hedge or wall and surrounded it by an heraldic emblem. The fantastic lantern over the gateway would, of course, correspond to the clitoris in a woman. One of these artists who always makes a thing something else and doesn't know he's doing it.

Another patient showed symbolic thinking on TAT Card 17 GF—"I don't understand this, unless it's to do with Japan"—utilizing the rising sun motif. Some of the more chronic patients carry their symbolizations into practice; this was demonstrated *in excelsis* by the patient who smoked cigars "to keep the airships up"!

7. *Apparent inability to question the premises of a thought process or to revise and re-integrate impressions.*—An example is shown by a response on TAT Card 2.

This is the pyramids of the Sahara—this might be a maid or mother. Reapers of the field. Looks like sand dunes. Her collar isn't set right by that side. I don't see how they could have a field beside a desert.

Here, a misperception—seeing the barn roofs as the pyramids—set off a train of percept-integration which the patient cannot revise when it leads to something she thinks absurd. Another series of examples of this inability is seen in responses which contain unquestionable contradictions passed without comment, e.g.:

Card 3.—The door is open . . . the girl cannot get through the door.

Card 17.—There is a bright sun . . . the stars are in the sky.

8. *Unusual choice of words.*—The following is an example of unusual wording in response to Card 2, TAT:

Literature on one side and agriculture on the other pending to the Irish. This is pending to the religious more, to the Sacred Heart, yes, that is Rosary.

Here the theme is a common norm—a story of the conflict between a girl's desire for education (or religion, less often) and her poor agricultural background. The wording adds a new quality.

9. *Individuality of theme*.—A good example of this is the following on TAT Card 17 GF :

There is a girl with a big black dog waiting for the time when there is a man with her on the bridge.

Asked where the dog was, this patient replied, "Oh, you can't see the dog ; it is hidden by the parapet." One does not expect to meet with this tale again in a lifetime !

Some significant differences of TAT content between the paranoid-schizophrenic group and control group were noted, and these were compared with the differences previously observed between controls and a depressed group. This comparison was made under three headings :

(1) Themes appearing in paranoid records but in neither control nor depressed groups.

(2) Themes appearing in paranoid and depressed records, but not in the control group.

(3) Themes appearing in paranoid and control records, but not in the depressed group.

For example, in TAT Card 1 (the official description is "A young boy contemplating a violin which rests on a table in front of him"), it was noted that unusual descriptive comment on the boy—e.g. "he has one eye open and one eye closed," "he is lazy-looking," etc.—was almost specific to the paranoid group. On the other hand, the paranoid group resembled the controls, and were unlike the depressions in that their stories did not indicate a lack of ambition or the absence of external forces. Finally, the paranoid group resembled the depressions, and were unlike the controls in the number of "broken-violin" responses.

The uniqueness of the paranoid themes as a whole, as compared with the other groups, lay in their—

(1) Concentration on background.

(2) Frequent misperceptions of sex.

(3) Symbolic settings—Biblical, mythical, etc.

These findings are consistent with those found in another projective field—free painting—in which Reitman (1947) describes concentration on background and prevalence of symbolic elements in schizophrenic paintings.

Ways in which the paranoid group approached the depressions but were distinct from the controls were in their—

(1) Failure to see family situations.

(2) Failure to suggest futures or outcomes.

(3) Failure to comment on the mood of the people in the pictures.

(4) Absence of comment on the unreality of certain cards.

(5) Broken-violin responses on TAT Card 1.

The more depressed patients (also the paranoid-depressive psychotics) tended to show the "broken-violin" and "broken-doll" responses even more com-

monly than noted in our series of depressed patients. Also, comments on the *TAT* on shadow, darkness and pallor are often paralleled on the Rorschach records by C' (black) responses, held by a number of authorities to indicate depression. Rosenzweig and Fleming (1949) remark of "broken-violin" responses, which they found in a significantly higher proportion of psychotic subjects, that "if . . . the characterization of the instrument by the subject is in some sense to be regarded as a characteristic of himself, it is reasonable to conclude that mental patients experience themselves as disintegrated or 'broken' about three times as frequently as do normal individuals."

Finally, the paranoid group resembles the controls, but are distinct from the depressives in—

- (1) The presence of drive, ambition, etc.
- (2) The ability to see cause and conflict.
- (3) The ability to see alternatives.
- (4) The ability to imagine the implied present.
- (5) Their responses to Card 16 (blank card).

In the depressive it was noted that imagination was reduced or absent, and reference was made to Beck's comment on the lethal effect of depression on the imagination. This does not appear to be a prominent feature in the paranoid group, so far as the implications of the existing state or present time are concerned; e.g. in *TAT* Card 5 the presence of other unseen people in the room is adequately commented on. There is, however, still an inability to suggest further outcomes, and this is the reason for the distinction made in our reference to the "implied present."

The resemblance of the control and paranoid group responses on *TAT* Card 16 must alter our previous suggestion that the hospitalization of the depressed group was the reason for their significantly higher proportion of "family" responses. If this was indeed a factor, then there are still features in the depressions *per se* which are more probably responsible for the themes evoked.

An explanation for some of these findings may now be hazarded. The frequent misperceptions, omissions and bizzarrities found in the *TAT* records become clearer if we remember that the schizophrenic tends to organize percepts into images of concrete objects; if the capacity to abstract is lost, a geometrical figure conveys no meaning unless it can be perceived concretely, e.g. as a window or some objective, concrete thing. Similarly the paranoid-schizophrenic tends to organize percepts into something meaningful to his own autistic thought system (*cf.* Goldstein, 1940; Goldstein and Bolles, 1938; Goldstein and Katz, 1937).

The tendency for these patients to have perseverated, individual complexes as a sort of "filter" through which they must perforce receive all their external impressions was commented upon by Jung in 1909. Writing first of the results of Freud's investigations, he said they may be summed up as follows:

"The symptoms of paranoid dementia praecox contain thoughts both in form and content which, in consequence of their disagreeable feeling-tone, become unbearable to the conscious ego, and hence become repressed. These repressions

then determine the nature of the delusions and hallucinations, as well as the whole general behaviour of the patient. Hence, whenever a person shows an apperceptive paralysis, the manifested autisms contain the disassociated idea complexes—the whole army of obsessive controlled thoughts then becomes unchained."

Jung considered this view too narrow, and went on to put forward a more inclusive theory :

" Nevertheless, the mechanisms of Freud are not comprehensive enough to explain why a dementia praecox originates rather than a hysteria ; we must therefore postulate that in the case of dementia praecox there is a specific resultant of the affects (toxine ?), which causes a definite fixation of the complex by injuring the sum total of the psychic functions. But one cannot, however, dispute the possibility that the ' intoxication ' might appear also as primary as a result of ' somatic ' causes, and then seize the last complex which happened to be there and change it pathologically."

At all events, it seems that our paranoid patients misperceive because they organize part of the field in a concrete fashion and lack the ability to criticize the misperception. Their misperceptions are perseverated, and they tend to see in fact whatever is most meaningful to them ; finally, we find that the most frequent misperception common to the group is that of sex reversal. This, it may be noted, is also the most common isolated misperception, and is often found where the rest of the picture is described in obsessively meticulous and accurate detail.

SUMMARY.

The Thematic Apperception and Rorschach tests were given to a group of 25 paranoid schizophrenics and to 25 controls. The *TAT* results of both groups were scored for objective values such as time factors, identification with the picture, misperceptions, etc., and the themes of the paranoid-schizophrenic group were compared card by card with those of the controls ; the Rorschach test scores of the groups were also compared. Finally, the paranoid-schizophrenic group is compared with a depressed group previously studied.

A number of positive findings emerged, in so far as statistically significant differences were found between the groups. The most outstanding features shown by the paranoid schizophrenics were (a) an increase in the time taken on the *TAT*, in the mean response-time and in the range of response-times ; (b) an increase in autistic thematic material, ranging from what is merely fantastic or bizarre thinking to gross autisms and concretization of thought ; (c) hesitation, blocking and difficulty with themes concerning sex and death ; (d) tendency to reverse the sex of characters depicted in the cards ; (e) use of symbolic settings and preoccupation with background detail ; (f) perseveration.

On the Rorschach scoring was higher for poor original responses, rare detail and white-space responses ; there are also features of the content of the responses which bear some relationship to the *TAT* material.

The paranoid-schizophrenic group show in their test results a number of points of divergence from a depressive group ; these are considered to constitute significant indications of the different processes occurring in these two psychiatric syndromes.

We conclude that paranoid schizophrenia is characterized by a (? mainly psychogenic) focal emotional conflict in a setting of (? mainly somatogenic) concrete thinking and perseveration. The development of these features, and their interweaving in the human organism, lead to certain outward clinical manifestations—illusions, autisms and loss of insight, along highly individualized lines.

In conclusion, we should like to express our indebtedness to Dr. Rolf Ström-Olsen and Dr. James Valentine, for access to cases at Runwell Hospital and at Scalebor Park ; also we must thank, for reading the script and making several helpful suggestions, Graham Foulds, Psychologist, Runwell Hospital ; Professor Rex Knight, Department of Psychology, Aberdeen University ; Professor W. M. Millar, Department of Mental Health, Aberdeen University.

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THE ABILITIES OF ADOLESCENT AND ADULT HIGH-GRADE MALE DEFECTIVES.

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I. INTRODUCTION.

DURING the first half of 1949 a battery of cognitive and personality tests was given to a sample of 104 adolescent and adult high-grade male defectives resident in Darenth Park, Dartford. The testing was carried out by N. O'Connor and the writer, in collaboration with Dr. J. M. Crawford, Deputy Superintendent of Darenth Park. The following report presents a summary of the cognitive and motor test findings, and discusses some of their implications.

In the Appendix are included factual and statistical data not included in the body of the report.

II. REVIEW OF LITERATURE BEARING ON INTELLIGENCE AND COGNITIVE ABILITIES OF HIGH-GRADE FEEBLE-MINDED ADULTS.

(a) *The " Upper Limit " of Defective Intelligence.*

The Mental Deficiency Act of 1927, which states that " mental defective-ness means a condition of arrested or incomplete development of mind existing

before the age of 18 years," lays down no criteria by which mental development may be assessed. In principle, however, it is generally agreed that before an individual can be judged to be mentally defective he should be shown to be both cognitively defective, and in need of care, supervision, and control. A few individuals, it is true, are certified on "moral" or social grounds; but in such cases defects of personality or aberrations in conduct are added to deficiency in intelligence. Individuals of normal or even dull intelligence are not usually certified when they break the law or offend against the social code. Cognitive ability is usually assessed by mental tests.

In mental deficiency practice the early work of Goddard (1914), Terman (1916), Burt (1921) and others following up the pioneer researches of Binet suggested certain critical levels in intelligence, below which individuals might be considered cognitively defective. The usefulness of the Binet-Simon test in enabling psychologists to differentiate between normal and defective children led some to define mental defect exclusively in terms of scores on this test. Thus, Terman stated that, in the diagnosis of mental defect,

" . . . nothing else is as significant as the I.Q. All those who test below 70 I.Q. by the Stanford revision of the Binet-Simon scale should be considered feeble-minded, and it is an open question whether it would not be justifiable to consider 75 I.Q. as the lower limit of 'normal' intelligence. Certainly a large proportion falling between 70 and 75 can hardly be classed as other than feeble-minded, even according to social criteria."

Although psychologists would not to-day give unqualified acceptance to such an extreme statement of the psychometric definition of mental defect, none the less, in psychiatric writings, the concept of 70 I.Q. is still widely accepted as marking the upper limit of defective intelligence. Henderson and Gillespie (1944) state that an I.Q. of less than 70 (on the 1937 Revision of the Stanford-Binet test) "corresponds roughly to clinical feeble-mindedness, and of below 40 to imbecility." Penrose (1949) repeats the traditional classification of grades of mental defect in terms of "Binet intelligence test level," though he recognizes its limitations. (According to this, the feeble-minded have, as children, I.Q.'s of 50-69, and as adults, mental ages of 7-10; imbeciles have, as children, I.Q.'s of 20-49, and as adults, mental ages of from 3-6; idiots have I.Q.'s under 20, or mental ages under 3 years.) Curran and Guttman (1946) state that "very special reasons must be present before it is possible to certify as mentally defective an individual with an I.Q. above 75." Similar statements could be quoted from other text-books which include chapters on mental deficiency.

A notable opponent of this point of view is Tredgold, who has always maintained that social adaptation, and not cognitive ability, is the decisive factor in deciding whether or not an individual is to be deemed feeble-minded. However, as Porteus (1941) points out, though Tredgold rejects the intelligence quotient as the basis of a satisfactory definition, yet assessment of the kind and degree of incomplete mental development used by Tredgold as criterion "must certainly be affected by the use of mental tests."

Summing up the evidence, it might be said that over the last 40 years psychiatric opinion has inclined to the opinion (i) that intelligence tests are necessary for diagnostic purposes in all but the most severe forms of mental deficiency; (ii) that for the feeble-minded, as opposed to imbeciles and idiots, intelligence is only one factor to be considered, deficiencies in temperament and character being equally important, and in some cases of decisive importance; (iii) that although dull (I.Q. 70-85), or even normal (I.Q. 85 plus) individuals may be certified, only "very exceptional circumstances" will justify such certification. One would, in short, expect to find very few individuals in M.D. institutions with I.Q.'s above 75.

(b) *Other Abilities of Defectives.*

The use of intelligence tests as diagnostic instruments has deflected interest from other cognitive and motor abilities and their assessment. It is well known that defectives tend to be clumsy, to lack fine sensory discrimination, and to be slow in movement. A review of studies dealing with these "special abilities" has been published elsewhere (Tizard and O'Connor, 1950), and the evidence will not be repeated here. It may, however, be said that little systematic study of the abilities of defectives which are not highly correlated with test intelligence, has been made, at least in recent years, using adequately standardized tests.

It was to throw some light on the distribution of abilities in high-grade adult defectives (i.e. over 16 years old), so that at a later date the tests might be used for vocational guidance purposes, that a testing programme was carried out in Darenth Park. In this paper we shall be concerned only with scores on tests of cognitive and motor abilities and their intercorrelation, among what we believe to be a fairly typical sample of high-grade adult and adolescent male defectives recently admitted to an institution in the London area.

III. EMPIRICAL FINDINGS WITH ADULT DEFECTIVES.

Five Intelligence tests, 12 of the 15 subtests devised by the United States Employment Service for vocational guidance purposes, and a Rail-walking test, devised by S. Roy Heath, jun., as a test of general locomotor co-ordination, were given to 104 adult high-grade males in the institution. The average age was nearly 21 years; only 3 patients were over 30 years of age, and the youngest patients were nearly 16. Testing occupied several months.

Results of the testing are presented below, Intelligence test results being presented in Section III (a), other cognitive test results being presented in Section III (b).

(a) *Intelligence Test Findings.*

Tests Given.

The following tests were given:

Kohs Blocks, Alexander Version.

Progressive Matrices, 1938, untimed.

Binet Vocabulary subtest of 1937, Terman Merrill Revision, Form L.

Porteus Maze test, Vineland Revision.

Cattell Non-Verbal Intelligence test. Form I.B.

Some relevant information regarding the method of administration of these tests is presented in the Appendix.

Results.

Tables of results are presented below. In Table I are given frequency distributions of the I.Q.'s on each of the tests, together with the mean and median I.Q.'s and the standard deviations. Table II gives the intercorrelations between the tests, as well as the means and standard deviations of raw scores on all of the tests included in the battery.

Table III presents the number of patients with one or more I.Q.'s above 75 on each of the five tests.

The following points are selected for discussion :

(i) *The Distribution of I.Q.'s.*

TABLE I.—*Frequency Distributions of I.Q.'s on Five Intelligence Tests not Corrected for Differences in S.D. N = 104.*

I.Q.	Kohs.	Matrices.	Binet Voc.	Porteus I.Q.	Cattell.*
Median I.Q.	75.36	72.33	71.10	85.69	65.10
Mean I.Q.	75.41	74.55	71.38	82.56	63.78
S.D. of I.Q.'s	17.00	12.73	14.89	22.00	14.07
120+	1	0	2	3	0
110-119	2	1	0	11	0
100-109	5	2	2	4	3
90-99	13	12	5	18	1
80-89	23	16	11	29	4
70-79	20	33	40	13	22
60-69	15	28	23	8	43
50-59	19	10	18	10	15
Less than 50	6	2	3	8	16

* Published figures by Cattell (3) give the standard deviation of this test as between 20 and 25 points. A "corrected" I.Q. obtained by reducing the standard deviation from 25 to 16 points gives a median I.Q. of 72.08 and a mean of 73.42.

Table I shows that there were considerable differences in the comparative difficulty of the different tests. The Porteus Maze test, on the one hand, with a mean I.Q. of 82, was relatively easy; the Cattell test, on the other hand, with a mean I.Q. of 63, was relatively difficult. The other three tests, Kohs Blocks, Matrices, and Binet Vocabulary, lay in between, giving mean I.Q.'s between 71 and 75.

(ii) *The Intercorrelations Between Tests.*

In Table II are given the intercorrelations between all of the tests included in the battery. An inspection of the table of correlations shows that, whereas

TABLE II.—Correlations Between 18 Cognitive Tests, Together with First Factor Loadings and Communalities (h^2) N = 104.
(Decimal Points Removed.)

Std. dev. (S)	18.00	0.30	5.37	21.07	17.14	0.31	10.49	4.44	6.58	30.85	5.71	10.18	7.82	11.08	11.28	4.20	3.90	30.01
Mean score	12.59	24.20	12.06	82.50	48.08	14.48	25.05	6.10	11.10	97.51	10.88	48.77	13.79	75.40	79.92	20.70	21.14	82.89
Test.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Kohs	1	..	65	..	62	59	30	34	61	36	59	28	63	34	31	39	44	40
Matrices	2	..	..	54	61	50	31	39	47	26	48	29	57	36	34	38	40	24
Binet Voc.	3	..	..	..	..	..	..	14	..	..	..	..	..	..	..	..	..	..
Porteus I.Q.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cattell	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
G.A.T.B. A	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" C	7	..	..	..	..	..	..	13	37	43	30	56	41	41	40	44	52	26
" D	8	..	..	..	..	..	..	..	29	10	36	24	27	08	03	06	21	..
" E	9	..	..	..	..	..	..	..	..	37	71	48	68	37	33	36	48	34
" F	10	..	..	..	..	..	..	..	..	..	30	52	34	40	29	35	43	31
" G	11	..	..	..	..	..	..	..	..	..	..	33	56	29	24	32	34	20
" H	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" I	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" J	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" K	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" L	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" M	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" N	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" O	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" P	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
" Q	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rail test	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
First factor loading	..	72	66	..	62	80	71	56	32	75	51	64	81	65	62	67	77	49
Communality (h^2)	..	52	44	..	38	64	51	31	10	56	26	41	42	66	42	38	45	60

Calculations were made to 3 decimal places, and have been rounded off to 2 decimal places.

all except the Binet Vocabulary correlate positively and have, in consequence, significant positive loadings on the first common factor extracted from the battery, scores on this test failed to correlate significantly with *any* of the other cognitive tests. This result was not expected by the investigators, since, as is well known, Vocabulary scores are commonly considered to have high *g* loadings, and, indeed, have been recommended as "the best single test that can be given" to cases suspected of mental deficiency (Curran and Guttman, 1946).

(iii) *Our Test Results Compared with those of Certifying Officers.*

A third finding which emerged very clearly from the investigation was that both our test results, and those of the psychiatrists in the institution in which the testing took place, indicated that many of the patients were much more intelligent than one would have been led to believe from reading their certification orders. No evidence on this point will be presented in this paper, since many certification orders do not indicate how the diagnosis was arrived at, or if they give I.Q.'s, do not state the test from which the I.Q. was derived. But many examples could be given of patients whose behaviour, and whose test findings alike, indicated a degree of cognitive efficiency apparently undetected by the medical officers signing their certification papers.

The number of cases with I.Q.'s above 75 on one or more of the tests, together with the numbers for each test considered separately, is presented in Table III.

TABLE III.—*Number of Patients with One or More I.Q.'s Above 75 on Five Intelligence Tests.*

	Total No. in each category.	No. in each category for each test.				
		Kohs.	Matrices.	Binet Voc.	Porteus I.Q.	Cattell.
No. of S's with I.Q.'s above 75 on 5 intelligence tests	5	5	5	5	5	5
No. of S's with I.Q.'s above 75 on 4 intelligence tests.	9	9	9	5	9	4
No. of S's with I.Q.'s above 75 on 3 intelligence tests.	24	21	17	10	23	1
No. of S's with I.Q.'s above 75 on 2 intelligence tests.	26	16	3	9	24	0
No. of S's with I.Q.'s above 75 on 1 intelligence test	19	1	2	7	9	0
Total number of cases with I.Q. on one or more tests above 75 . . .	83	..	..	..	..	..
No. of I.Q.'s greater than 75 on each test.	..	52	36	36	70	10

(b) *Other Test Findings.*

Tests Given.

As mentioned in Section I, much less attention has been paid by psychologists and psychiatrists to the devising and standardizing of tests of abilities which are not considered to be closely associated with general intelligence,

than to the construction and standardization of intelligence tests. Consequently, in attempting to find tests by means of which the distribution of these abilities could be compared with that of a normal population, we were handicapped by the comparative absence of reliable and adequately validated tests. Many tests, such as the Oseretsky (Doll, 1936), Van der Lugt (1948), and Yarmolenko (1933) scales of motor proficiency, had to be abandoned, either because the material was unavailable, or because the standardization was felt to be too inadequate to make possible a comparison between our results and those of other workers dealing with normal adults, or with children. The battery finally decided upon was the United States Employment Service General Aptitude Test Battery, which has been soundly standardized on American industrial workers (27), and Heath's Rail-Walking test of locomotor co-ordination, which was standardized on American Army recruits (Heath, 1943, 1944), and has been used for testing defectives at Vineland Training School, New Jersey (Heath, 1942, 1946). A brief description of the tests included in the General Aptitude Test Battery, and of the method of administration and the standardization of the Rail-Walking test, is included in the Appendix. All it is necessary to say here is that eight of the twelve subtests of the General Aptitude Test Battery were paper-and-pencil tests, while the other four were apparatus tests (peg-board and pin-board tests). Scores on the paper-and-pencil tests are combined so as to give a weighted score with a mean of 100 and a standard deviation of 20 (for a normal adult population) on each of four aptitudes which the tests purport to measure. These aptitudes are: Spatial Aptitude, Form Perception, Aiming or Hand-eye Co-ordination, and Motor Speed.

The apparatus test scores are likewise combined to give scores purporting to measure Finger Dexterity and Manual Dexterity.

Results on Other Cognitive Tests.

A frequency distribution of the aptitude scores on each of the aptitudes which the tests purport to measure is presented in Table IV. The scores on the Rail tests are raw scores. The mean score on Heath's army population was 130, and the standard deviation 20 points. The scores for normal subjects on this test are markedly skewed, the maximum score obtainable being 153 points.

What emerges from the tabular presentation of scores is the following: (i) On tests of Spatial Aptitude the median score for this sample is just over one standard deviation below the population mean for normal adults; (ii) the median score on the tests of Form Perception is considerably lower, falling about $1\frac{1}{2}$ standard deviations below the population mean, as does the score for Aiming, or Hand-eye Co-ordination; (iii) the median scores for the sample on tests of Finger and Manual Dexterity fall about 2 standard deviations below the population mean; (iv) the median score on the tests of Motor Speed falls nearly $2\frac{1}{2}$ standard deviations below the population mean.

It would seem from this evidence that the mentally defective subjects had higher median scores on the more abstract tests of Spatial Aptitude and

Form Perception than on the tests demanding precision of movement, manual and finger dexterity, and, especially, motor speed.

TABLE IV.—*Frequency Distributions of Aptitude Scores on the General Aptitude Test Battery, and of Scores on Heath's Rail-Walking Test of Locomotor Co-ordination.*

Aptitude	S.	P.	A.	T.	F.	M.	Rail.
Median	79	69	67	54	62	61	84
<i>Aptitude score.</i>							
141+	..	0	0	0	0	1	4
121-140	1	0	1	1	0	0	9
101-120	10	7	10	4	2	3	13
81-100	38	34	14	9	19	19	32
61-80	44	25	37	24	33	29	21
41-60	11	29	27	37	32	26	17
21-40	0	7	12	24	17	16	6
0-20	0	2	3	5	1	10	2

(Mean score for an American industrial population on all G.A.T.B. tests = 100; S.D. = 20. On the Rail test the mean score for 1,013 soldiers was 130 points; median 140; S.D. 20)

Aptitudes mentioned in the table are described in the U.S.E.S. Guide (28) as follows:

S. *Spatial Aptitude*.—Ability to comprehend forms in space and to understand relationships of plane and solid objects.

P. *Form Perception*.—Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons.

A. *Aiming or Eye-hand Co-ordination*.—Ability to co-ordinate eyes and hands or fingers accurately so as to make precise movements with speed.

T. *Motor Speed*.—Ability to make hand movements, such as tapping rapidly. Ability to make a movement response swiftly.

F. *Finger Dexterity*.—Ability to move the fingers, and manipulate small objects with the fingers, rapidly or accurately.

M. *Manual Dexterity*.—Ability to move the hands easily and skilfully. Ability to work with the hands in placing and turning motions.

(c) *Summary of Empirical Findings.*

The following points, discussion of which will be taken up in the next section, emerged from this analysis of scores on 18 cognitive tests given to a sample of 104 young adult, high-grade, institutionalized male defectives.

(i) There were discrepancies of up to 20 points between the mean and median I.Q.'s got on one intelligence test (Cattell's) and those got on another (Porteus Maze), while those on three other tests lay in between. (ii) Intercorrelations between all of the cognitive tests were positive, and almost without exception significant, except for those between the Binet Vocabulary and other tests, none of which were significant. Sixteen of these were in fact negative. (iii) Our test findings, like those of the psychiatrists in the institution in which the testing took place, indicated that many of the defectives were more able than would have appeared from a reading of the reports made by some certifying officers. (iv) The General Aptitude Test Battery scores suggested that the defectives as a whole were relatively less retarded in Form Perception and in Spatial Aptitude than they were in Hand-eye Co-ordination, Manual Dexterity, Finger Dexterity, and Motor Speed.

IV. DISCUSSION OF TEST FINDINGS.

(a) Factors Influencing the Size of Intelligence Quotients.

As mentioned in Section I, common psychiatric opinion inclines to the view that an I.Q. of 70 to 75 marks the upper limit of mentally defective intelligence. Our own results do not support this belief. From Table II it can be seen that the number of patients with I.Q.'s above 75 varies enormously from test to test. Moreover, even on the most difficult test some 10 per cent. of the sample scored over 75 points of I.Q., even when these I.Q.'s remain uncorrected for size of standard deviation.*

In order to throw light on these findings something will be said about the nature of I.Q.'s, since considerable confusion on this point exists in mental deficiency practice.

(i) The value of an I.Q. depends, among other things, on the standard deviation of I.Q.'s given by the test. In the early Goddard, Terman, and Burt Revisions of the Binet test, from the use of which the concept of I.Q. levels first gained currency, the standard deviation was believed to be about 12 or 13 points. Hence, an I.Q. of 70 was believed to fall about $2\frac{1}{2}$ standard deviations below the mean, and so cut off only about 1 per cent. of the population who were regarded, partly on other grounds, as being mentally defective.

On some more recently devised tests, however, such as Cattell's test, which was included in our battery, the standard deviation is 20, and possibly 25 points (Cattell (1948) gives both figures). Hence, an I.Q. of 70 falls not much over one standard deviation below the mean, and so cuts off about 10 per cent. of the population. Clearly differences in standard deviation are of great importance.

It should be noted that the size of the standard deviation is of especial importance as far as the I.Q.'s of defectives are concerned.

Unfortunately differences in and uncertainties regarding the size of standard deviation are found in even the most elaborately standardized tests, such as the 1937 Revision of the Stanford Binet test. It is significant that though the 1937 Revision is said to be especially useful in diagnosing cases of mental defect, the standard deviation varies from 13 points at age 6 to 20 points at age 12, so that an I.Q. of 74 at age 6 is equivalent to one of 60 at age 12. How little attention has been paid to this can be gathered from the fact that though Terman and Merrill note these discrepancies, they do not make corrections for them in the Tables of I.Q.'s given at the back of their Manual. (These corrections have, however, been published by McNemar (1942) in his statistical discussion of the test.)

One consequence of this is that standards of certification based on this, or similarly standardized tests, are bound to differ from one age to another—for purely statistical reasons—unless tables of corrected I.Q.'s are used.

A further consequence is that any attempt to assess the incidence of mental

* When the I.Q.'s are corrected to a standard deviation of 16 points, nearly 50 per cent. had I.Q.'s above 75 on this test.

deficiency in psychometric terms, using this test, is likely to give results which are seriously misleading.*

(ii) If we could be sure that the standardization sampling adequately represented individuals of all levels of ability, and that the distribution of scores was normal, corrections in the size of the standard deviation could easily be made. In fact, however, it is rare that the assumption of representative sampling and normality of distribution can be made in psychological testing. It is worth pointing out in this respect that the 1937 Stanford Binet test, despite the presence of "Average Adult" and "Superior Adult" items, has never been standardized as an adult intelligence test. In the standardization sample only 50 boys and 50 girls for each of the ages 15 to 18 were included. Of these, moreover, nearly all were still at school. From the table presented by Terman and Merrill (1937) it can be seen that of "subjects who did not complete high school," only 4 aged 16, 12, aged 17 and 11 aged 18 were included in the standardizing sample. Though subjects who did not complete high school are likely to include the vast bulk of the dull and defective, for whom the test is supposed to be especially useful, it appears that the standardization sample included only 27 such subjects, spread out over a 3-year age range. It is, of course, impossible to correct for such sampling inadequacies in the manner adopted by Terman and Merrill.

This means that the standard deviation of I.Q.'s on this test for older children and adolescents is almost certainly greater than the 18-20 points given by the Stanford investigators. It means in consequence that one is bound to *under*-estimate the intelligence of older children and of adults and adolescents who deviate markedly on the mean for this test. Ten per cent., possibly more, of the adult population would have I.Q.'s under 70 if tested by the Binet test.

(iii) Similar criticisms could be levelled against other tests for children which provide tables of norms for adults, since their standardization in most cases is weak. The fact is that there is no intelligence test which has been standardized so as to make possible an accurate estimation of the I.Q. of subnormal English adults. The Wechsler Bellevue test has been standardized for an American population, but not for an English one; and the face validity of some of the items in the Performance Scale, as far as an English population is concerned, seems to suggest the need for restandardization.

(iv) Owing, then, first to differences in the reported standard deviations of intelligence tests, and secondly to the likelihood that the estimations of the

* The statistical character of the I.Q. was pointed out by Burt (1921) in setting his thresholds for defective and normal intelligence. Penrose (1949) also deals briefly with this point, but fails to note the differences in the standard deviation of the I.Q.'s of the 1937 Terman Merrill Revision for different chronological ages, or to suggest that the standard deviation of the I.Q. for adults is probably at least 20 points. Penrose also continues to advocate the use of the concept of "mental age," despite the destructive criticism of this concept given by Wechsler (1944).

That the standard deviation of I.Q.'s on the 1937 Revision differs from one age to another for statistical and not for psychological reasons, is explained by McNemar (1942) in his discussion of the standardization of the test. McNemar does not, however, stress the inadequacies of the standardization sampling which makes the norms inapplicable to a more heterogeneous sample of the population. This gives to I.Q.'s more than one standard deviation below the mean an appearance of accuracy which is quite spurious, owing to the small number of cases on which such norms are based.

I.Q. of cases which differ markedly from the mean have been based on very few cases, the selection of which has been haphazard or systematically biased, it is virtually impossible to make a strict comparison between I.Q.'s got on different tests. The possibility of doing so is still further decreased if we abandon the assumption that intelligence tests are testing a single function of inborn, all-round mental ability. For once we abandon a single-factor theory of intelligence there is no reason why mean scores of defectives on different tests should not differ considerably, just as the mean scores on different Aptitude tests in the General Aptitude Test Battery differed considerably. We might then go on to explain such differences in psychological terms.

(v) Faced with results such as ours, some investigators have, in fact, proceeded to explain them in psychological terms, without considering statistical and selection factors which make their conclusions invalid. For example, it is sometimes stated that defectives tend to get much poorer scores on group tests than they do on individual tests, where they are able to be given personal supervision and appropriate encouragement. Alternatively, one may postulate that many so-called defectives are deficient only in verbal ability, or educational ability, but may have high or low practical ability, which, according to this theory, is only moderately correlated with verbal ability. Such a hypothesis has been put forward by Duncan (1942), and has gained the support of W. P. Alexander (1946) following an examination of the test scores of E.S.N. school-children on the Binet and Alexander tests.

One or both of these hypothesis may well be true, and we had hoped, at one time, to be able to make a rigorous examination of them. So little information was available as to the standardization of the tests, and the distribution of extreme scores, that comparisons between one test and another would have been at best of doubtful value.

(vi) If, however, we assume that Cattell's published figure of 25 points represents the "true" standard deviation of I.Q.'s for an adult population on this test, we can correct this to 16 points so as to make Cattell's scores comparable with those achieved on other tests. If we make this correction, the results on this test now support the findings of Binet Vocabulary, Kohs, and Matrices. The mean and median I.Q.'s on all tests are above 70 I.Q.

Hence, though the evidence is not conclusive, it suggests that, according to our results, between a quarter and a half of our subjects regarded as feeble-minded could more properly be classed as dull or subnormal rather than cognitively feeble-minded. Both psychological and statistical factors make discussion of this finding difficult.

(b) *Vocabulary Scores.*

As noted in Section III(a) above, the correlations between Binet Vocabulary scores and other cognitive test scores were effectively zero, although all other tests included in the battery correlated positively, and had, in consequence, significant loadings on the first common factor. In view of the great importance which attaches to Vocabulary tests in mental deficiency practice, it was felt that some explanation of this finding was demanded.

One possible explanation was that since the remainder of the tests were non-verbal tests, the general factor extracted could not be identified with Spearman's g , but was, instead, a complex non-verbal, practical factor unrelated to verbal intelligence, of which Binet Vocabulary is considered to be a good test. This explanation undoubtedly takes us part of the way towards explaining our results. However, lack of statistical information about the distribution of test scores in an unselected sample, and their intercorrelation makes us hesitate to explain our results by means of an untested psychological theory.

An additional difficulty comes from the selection process through which mental defectives pass before being committed to institutions. One of the most frequently used tests is the Binet Vocabulary test, or some equivalent. Inability to define common words is commonly thought to be a significant indicator of mental deficiency.

Since this is so it follows that individuals with low Vocabulary scores are more likely to be considered defective than are individuals with high Vocabulary scores, irrespective of their other abilities. If, as appears often to be the case, few if any other standardized tests are given, Binet Vocabulary becomes practically the sole psychometric arbiter of intelligence. In consequence, Binet Vocabulary scores are effectively partialled out, or would be, were it not for the fact that individuals with high Vocabulary scores are sometimes admitted to mental deficiency institutions. Such individuals, however, tend to be so grossly incompetent in other respects that their high verbal ability is not considered a sufficient reason for excluding them from M.D. institutions.

In so far as this argument is valid, it helps to explain why it was that scores between Vocabulary and other intelligence tests correlated negatively. Plotting Vocabulary and other intelligence test scores showed that a few individuals with high Vocabulary scores did, in fact, tend to score below the mean on other tests, and thus to account for the slight negative association between Vocabulary and other cognitive test scores.

We cannot, however, from our results, draw any conclusions as to the relationship between Vocabulary and other cognitive test scores of an unselected sample, even if composed of individuals of a restricted range of ability. For, as R. L. Thorndike (1949) has pointed out in a recent book on personnel selection "When selection is based, as it often is, on a clinical judgment, which combines in an unspecified and inconstant fashion various types of data about the applicant, and when this judgment is not expressed in any type of quantitative score, one is at a loss to know how to estimate the extent to which the validity coefficient for any test procedure has been affected by that screening."

None the less, we believe that more research into the association between low verbal ability and other cognitive ability needs to be carried out. We feel, too, that Binet Vocabulary, as an index of cognitive deficiency, should be treated with some caution.

(c) *Our Test Results Compared with those of Certifying Officers.*

The discrepancies between our test results on the one hand, and on the other hand, the test scores recorded by certifying medical officers, has been remarked on

in Section III. These discrepancies are believed to be related to the fact that owing to increases in the standard deviation of the 1937 Terman Merrill Revision of the Stanford Binet test, the I.Q.'s of subnormal adults when tested by this test are likely to be lower than I.Q.'s got from earlier tests upon which I.Q. thresholds are based.

It is believed, too, that the extensive and sometimes exclusive use of the Binet Vocabulary test contributes to an underestimation of the mental ability of some defectives. Very possibly other factors, such as emotional disturbance at the time of testing, actual changes of I.Q. owing to growth, and, of course, the part which factors other than cognitive ones play in certification, all contribute to cause a writing down of the I.Q. on the part of certifying officers. Whatever the reason, the fact remains that certifying officers probably certify as defective more dull or subnormal adults than they record on their certification orders.

This would not matter greatly if the dull and often unstable adults, who are at present certified as mentally defective, were able to be given the care, supervision and control they need, in institutions and homes designed to deal with just this type of patient. Unfortunately this is by no means the case to-day. There are few institutions in the country which do not include in their population both low-grade custodial cases, and those high-grade subnormal adults whose only need is usually for temporary protection against society, and for a certain amount of guidance and control.

At present, in large institutions, such patients are usually placed in separate wards and are given a different type of occupation and treatment, so far as this can be arranged. It is not possible always to segregate these patients completely from low-grade cases. The effect, both on the patients themselves and on their relatives, who are sometimes shocked to find their quite "normal" children in an institution in which many low-grade imbeciles and idiots can be seen, is likely to be traumatic.*

A desirable experiment in the field of mental deficiency practice would be the setting up of more institutions in which only high-grade cases were placed. Here training programmes designed explicitly for high-grade adults could be put into operation. This need is widely recognized to-day; but it has yet to be fulfilled through appropriate administrative and legislative action.

(d) *Discussion of Results on the General Aptitude Tests.*

(i) The results of the General Aptitude Test Battery aptitude scores suggest that in the cognitive field tasks demanding motor co-ordination and precision of movement are more difficult for defectives than are tasks demanding form and space perception.

This finding is, however, put forward with some hesitation. We have little information regarding the distribution of the aptitude scores for the United States standardizing sample. It is possible that for scores which

* Dr. Crawford emphasizes that some feeble-minded or subnormal women in mixed wards show a sense of responsibility towards and interest in low-grade patients which gives them a feeling of confidence and an outlet for affection. In such cases it is the effect on the relatives rather than the patients which is likely to be unfortunate.

fall more than about one standard deviation below the mean, the distribution is no longer normal. The median performance of our sample might, in consequence, be relatively no worse on the Sensori-motor and Speed tests than on the Space and Form Perception tests. The field is clearly one in which more research needs to be carried out.*

(ii) *Significance of Results for Vocational Guidance.*

The United States Employment Service has put out its General Aptitude Test Battery for vocational guidance purposes. If we accept the norms given by them it would seem that, largely because of the comparative excellence of the Form Perception scores, 34 per cent. of the sample could be regarded as suitable for jobs falling into one or more of the occupational categories for which these tests are designed to select workers. These occupational categories do not include simple manual and labouring work, but comprise semi-skilled and skilled jobs.

The writer would be very happy with this finding were it not for the fact that in the majority of the cases the type of work for which they would qualify would be that designated by the United States Department of Labour as "Close Visual Inspection" or "Simple Visual Inspection." It may be doubted whether, on the basis of these test results, defectives should be drafted into work of this type, rather than into work demanding simple motor movements, for which, to judge from these findings, they are relatively less well equipped. Clearly more research needs to be done before the results of such tests as these can be used with confidence for vocational guidance purposes.

V. CONCLUSIONS AND SUMMARY.

1. Literature bearing on the intelligence of mentally defective adults is reviewed. It is concluded that psychiatric practice still accepts a Binet I.Q. of between 70 and 75 as marking the upper limit of mentally defective intelligence, despite the fact that the versions of the test upon which these standards were originally based are no longer in use. The 1937 Stanford Revision of the Binet test, which has replaced them, has greater standard deviations, so that about ten times as many adults would have I.Q.'s as low as 70 on this as had I.Q.'s of 70 on older versions of the test. The use of the Binet test as an adult intelligence test is criticized, and it is pointed out that no test at present in use can be considered satisfactory; the Wechsler Bellevue test, which is the best individual adult intelligence test available, has been standardized for an American, but not an English population.

* It is of some interest that Eysenck (1947) found that Speed tests and Sensori-motor tests were among the tests which gave the most significant differences between scores of normals and neurotics. In other words, these discrepancies we found in our sample might be due to selective sampling on both intelligence and neuroticism, with the stress on the latter. An attempt to check this hypothesis has been made by O'Connor (16, 17), who correlated these and other test scores with a psychiatric rating of the defectives comprising this sample.

Correlations of 0.295, 0.237, 0.292, and 0.233 were found between the Rail-Walking test, the Peg Board, the Pin Board, and progressive Matrices on the one hand, and a four-point rating of Stability.

The concept of "the" intelligence quotient is criticized, and difficulties in the way of deciding whether defectives are relatively more retarded in some respects (e.g. verbal intelligence) than in others (e.g. practical ability) are discussed.

2. The inadequacies of our present knowledge regarding cognitive abilities of defectives which are believed to be not highly correlated with intelligence are pointed out.

3. Results of a battery of 18 cognitive tests given to a sample of 104 high-grade adolescent and adult male defectives, resident in an M.D. institution, are presented and discussed. The following results were found:

(a) The mean and median I.Q.'s in five intelligence tests were, when corrected for differences in standard deviation, all over 70 points.

(b) The correlations between the tests were positive and significant, except for those between the Binet Vocabulary and other tests, which were not significant.

(c) Our research gave I.Q.'s which were in many cases considerably higher than one would have expected to find from reading reports made by certifying officers about the cognitive abilities of the patients. (No evidence for this statement was presented.)

(d) The test scores on the United States Employment Service General Aptitude Test Battery which was given to the patients showed them to be less retarded in Form Perception and Spatial Aptitude than in Hand-eye co-ordination, Manual Dexterity, Finger Dexterity, and Motor Speed.

4. Difficulties in the interpretation of these results are discussed. The use of the General Aptitude Test Battery for vocational guidance purposes is questioned.

5. There are probably more dull or subnormal (rather than cognitively defective) adults in M.D. institutions than appears to be generally realized to-day.

6. The separation of high-grade from low-grade cases, by placing them in institutions designed to deal explicitly with just this type of patient, is urged.

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Our thanks are due to Dr. J. K. Collier Laing, Medical Superintendent of Darenth Park, for his co-operation and for the facilities which he and his staff made available at Darenth Park.

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APPENDIX.

(a) *Sample.*

The sample consisted of 104 consecutive male admissions, over 16 years of age, to Darenth Park mental defective colony, over the preceding 3 years. Not included in the sample were (i) old men and those with a mental age of

less than 7 years (I.Q. less than 50); (ii) those who had been transferred, discharged, or sent on licence before being tested; (iii) those suffering from gross complicating physical disabilities. The selection of patients was made by Dr. J. M. Crawford, Deputy Superintendent of Darent Park: 104 patients took all the tests. The mean chronological age was 20.9 years, standard deviation 4.6 years. The mean I.Q.'s and standard deviations of I.Q.'s on five intelligence tests are given in Table I.

(b) *Administration.*

Tests were administered by N. O'Connor and the writer between January and June, 1949. Eighteen cognitive tests were given. Testing was carried out in the institution. Group tests were given to small groups of from 4 to 8 patients. Each patient spent between 4 and 5 hours taking the tests, which included objective tests of personality not discussed here.

(c) *Tests Given.*

Tests given are listed below. Tests (1) to (5) are standard intelligence tests widely used in this country. Tests (6) to (17) are subtests of the United States Employment Service General Aptitude Test Battery, copies of which were given to us by the United States Government for research purposes. Test (18) is a Rail-Walking test which has been used in the United States both with defectives and with soldiers.

The battery of cognitive tests thus consisted of:

(1) *Kohs Blocks, Alexander Modification.*—Norms derived by Vernon, and at present in use in the Maudsley Hospital were used in deriving I.Q.'s.

(2) *Progressive Matrices*, 1938.—This was given as an untimed test to small groups. Norms for the untimed version were used in estimating I.Q.'s. About half the patients finished the test within 20 minutes, finding it "too easy" to spend more time over. Some took considerably longer, however, one subject (Matrices I.Q. 108) spending 55 minutes over the test.

(3) *Binet Vocabulary Test* from 1937 Terman Merrill Revision, Form L.—Norms taken from R. L. Thorndike (1942) were used in estimating I.Q.'s.

(4) *Porteus Maze, Vineland Revision* (Porteus, 1933).

(5) *Cattell Non-Verbal Intelligence test, Form IB.*—Form IA was not available at the time of testing. In calculating I.Q.'s the norms for Form IA were used, since those for Form IB, which is an equivalent test designed for re-testing purposes, make allowance for practice effects following testing on Form IA. In general, I.Q.'s for any raw score on Form IB are about 4 points lower than those for the same score on Form IA.

(6) *Tool Matching* (G.A.T.B., Part A).—Consists of a series of exercises containing a stimulus drawing and four black-and-white drawings of simple shop tools. The examinee indicates which of the four black-and-white drawings is the same as the stimulus drawing. Variations exist only in the distribution of black and white in each drawing.

(7) *H Markings* (G.A.T.B., Part C).—Consists of a series of large capital H's. The examinee draws a short vertical line through the bar of each H with-

out touching the sides, working rapidly to draw as many lines as possible during the time allowed.

(8) *Computation* (G.A.T.B., Part D).—Consists of a number of arithmetic exercises requiring the addition, subtraction, multiplication, or division of whole numbers.

(9) *Two-dimensional Space* (G.A.T.B., Part F).—Consists of a series of exercises containing a stimulus figure and five geometrical figures (two dimensional line drawing). The examinee indicates which one of five geometrical figures is made by a rearrangement of the parts of the stimulus figure.

(10) *Speed* (G.A.T.B., Part G).—Consists of a series of large rectangles. The examinee taps with pencil to make three dots in each of the rectangles, working as rapidly as possible during the time allowed.

(11) *Three-dimensional Space* (G.A.T.B., Part H).—Consists of a series of exercises containing a stimulus figure and four drawings of three-dimensional objects. The stimulus figure is pictured as a flat piece of metal which is to be either bent, or rolled, or both. Lines indicate where the stimulus figure is to be bent. The examinee indicates which of the four drawings corresponds to the stimulus figure.

(12) *Mark Making* (G.A.T.B., Part K).—Consists of a series of squares in which the examinee is to make three pencil marks, working as rapidly as possible. The marks to be made are short lines, two vertical, and the third a horizontal line beneath them.

(13) *Form Matching* (G.A.T.B., Part L).—Consists of two groups of variously shaped line drawings. The examinee indicates which figure in the second group is exactly the same size and shape as each figure in the first or stimulus group.

(14) *Place* (G.A.T.B., Part M).—The equipment used for this test, and for Part N, consists of a rectangular wooden board (Peg board) divided into two sections, each section containing 48 holes. The upper section contains 48 cylindrical wooden pegs. The examinee removes the wooden pegs from the holes in the upper part of the board and inserts them in the corresponding holes in the lower part of the board, moving two pegs simultaneously, one in each hand. This performance is repeated two more times, with the examinee working rapidly to move as many of the pegs as possible during the time allowed for each performance.

(15) *Turn* (G.A.T.B., Part N).—The equipment described under Part M is used for this test. In this case the lower section contains the 48 cylindrical pegs. The examinee removes a wooden peg from a hole, using one hand, turns the peg over with the same hand so that the opposite end is up, and returns the peg to the hole from which it was taken. The examinee works rapidly to turn and replace as many of the 48 cylindrical pegs as possible during the time allowed. This performance is repeated two more times.

(16) *Assemble* (G.A.T.B., Part O).—The equipment used for this test consists of a small rectangular board (Finger Dexterity Board) containing 50 holes, and a supply of small metal rivets and washers. The examinee takes a small metal rivet from a hole in the upper part of the board and at the same time removes a small metal washer from a vertical rod with the other hand ;

examinee puts the washer on the rivet, and inserts the assembled piece into the corresponding hole in the lower part of the board, using only one hand. The examinee works rapidly to move and replace as many rivets and washers as possible during the time allowed.

(17) *Dis-assemble* (G.A.T.B., Part P).—The equipment used for this test is the same as that described for Part O. Examinee removes the small metal rivet of the assembly from a hole in the lower part of the board; slides the washer to the bottom of the board; puts the washer on the rod with one hand and the rivet into the corresponding hole in the upper part of the board with the other hand. The examinee works rapidly to move and replace as many rivets and washers as possible during the time allowed.

(18) *Rail-Walking test*.—This simple test, devised by Heath (1942), requires a subject to walk heel to toe along three rails lying an inch or two off the ground. Of the three rails used, the first is 9 ft. long by 4 in. wide, the second 9 ft. by 2 in., the third 6 ft. by 1 in. Three trials are given for each rail. Score is a weighted sum of the number of feet walked. Full details, together with norms, have been published by Heath in his papers on the test.

Intercorrelations and Factor Analysis.

Intercorrelations between pairs of scores on all 18 of the cognitive tests included in the battery were computed. A table of correlations, together with mean scores and standard deviations, is presented in Table II. Raw scores were used in all cases in calculating correlations, and the means and standard deviations presented in Table II are those of raw scores. (Porteus Maze I.Q.'s were regarded as raw scores. They were derived from Porteus's (1933) norms.)

A factor analysis of the correlation matrix was made, using the centroid method. Only one factor was extracted, since significant residuals after extraction of the first factor were too few to warrant continuing the analysis. Inspection of the residuals showed that there was evidence in favour of postulating a second factor common to the Manual and Finger Dexterity tests (Tests 14 to 17), and a third factor common to the Space tests (tests 9 and 11).

Though the standard deviations of the U.S.E.S. subtests are somewhat less than those obtained by the U.S.E.S. in their standardizing samples (private communication from the U.S.E.S.), the correlations between the G.A.T.B. tests (Tests 6 to 17) are higher than those reported by the U.S.E.S.

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THE WECHSLER TEST IN CLINICAL PRACTICE :
COMPARISON OF PSYCHIATRIC AND PSYCHOSOMATIC DISORDERS WITH
A CONTROL POPULATION.

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IN adult intelligence testing the Wechsler-Bellevue Intelligence Test is increasingly used and is gradually taking the place of the Terman-Merrill. Not only is its verbal part better adapted to adult life, but it has the added advantage of being at once a verbal and a performance test. A comparison of a subject's achievements in the two parts of the test often shows where his strength and weakness lie, and so sometimes affords a clue to difficulties which he may experience in his work or otherwise without being aware of their cause.

Wechsler had standardized his adult norms in U.S.A. on more than 1,000 cases (1). For use in this country in what is known as the anglicized version, some of Wechsler's original questions of the verbal sub-test "Information" were changed, the order of presentation in the Vocabulary sub-test was slightly altered and in the sub-test "Arithmetic", shillings and pence were substituted for dollars and the decimal system (see Appendix). The pictures in the performance sub-test "Picture Arrangement" remained unaltered, although they strike many as being distinctly American. The question, therefore, arose whether the difficulties were the same in the original and in the anglicized version and, consequently, whether the test characteristics as given by Wechsler and other American workers (1, 2, 3, 4) could be applied in this country without reserve.

In this paper the scattergrams obtained from three groups of subjects tested with the anglicized version will be presented, and ranking orders of the sub-tests and of their items according to their difficulty will be put forward. Anybody conversant with the test will have noticed that some items are failed or some mistakes are made more frequently than others, and that the incidence of failures and mistakes does not necessarily follow the order of presentation. As the diagnostic significance of rare and frequent mistakes obviously is not the same, an investigation into the relative difficulty of the sub-tests and their items seemed to fulfil a useful purpose. Most psychologists will probably also agree that "patterns" rarely exactly fit the case, and that indications where to look for clues are usually more helpful. With these thoughts in mind the most fruitful approach seemed to be to define the groups which were to be tested on a broad basis instead of narrowing them down to a particular disorder, and to use as far as possible Wechsler's concept of plus and minus "sign" for the computation of the results. The "sign" has the advantage of being

more flexible than figures, and of being a constant reminder that one is dealing mainly with tendencies.

SUBJECTS.

Three groups of 20 people each were tested. The first group (A) consisted of 10 men and 10 women who were under investigation in the York Clinic because of mental illness: depressive and anxiety states, with or without hysterical features, 9; schizoid reaction with hysterical features, 2; schizophrenic reactions, 4; obsessive states with depression, 1; obsessive states with paranoid features, 1; manic reaction, 1; conversion hysteria, 2. The illness was in no case severe enough to require certification of the patient. Fifteen of the patients were totally, and 5 partially, incapacitated for work.

The second group (B) consisted of 16 women and 4 men under investigation in the York Clinic for various psychosomatic disorders: asthma with or without eczema, 4; migraine, 2; rheumatism, 2; obesity, 1; menorrhagia, 1; hypertension, 1; acne rosacea, 1; dermatitis and blepharospasm, 1; cardiospasm, 1; duodenal ulcer, 1; paroxysmal fibrillation, 1; thyrotoxic state, 1; menstrual psychosis, 1; depressive state with intensification of neurogenic pain, 1; vomiting, dysphagia, 1. They did not appear grossly unstable, and with few exceptions were capable of work; they were accommodated in the special research unit of the Clinic.

The third group (C) of 10 men and 10 women was the control group. The attempt was made to match them with the two other groups so as to cover the same ranges of age and I.Q. Otherwise they were unselected and were volunteers from the male and female nursing staff of the clinic, occupational therapists, medical students, laboratory assistants, clerical personnel, waitresses and kitchen hands. Inquiry revealed that they all had a stable work record, and that no signs of physical or mental disorders were manifest.

The age range was from 20 to 49 years, and the I.Q. (Wechsler Full Scale) in the main from 96 to 125. The exact distributions were:

		I.Q. full scale.					Total number tested.	Mean I.Q.
		Under 96.	96 to 105.	106 to 115.	116 to 125.	126 and more.		
Group	A	1	4	4	10	1	20	114
„	B	2	5	6	5	2	20	119
„	C	2	2	4	9	3	20	114

		Age.			Total number tested.	Mean age in years.
		20-29.	30-39.	40-49.		
Group	A	5	8	7	20	35
„	B	7	9	4	20	32
„	C	9	6	5	20	31

From the tables it can be seen that Group A was slightly older, and that group B was slightly lower in I.Q. As group A's intellectual abilities were impaired their I.Q. was potentially higher. The fact of group A's higher level

and of group B's lower level was due to extraneous causes and no inference should be made from it.

It will also be noted that the sex composition of group B is at variance with the other two groups. As Wechsler reported that, as his scales stand, there were no statistically significant differences amongst his population, it was thought that the overweight of the women in the group could be disregarded.

METHOD.

Throughout the study the mean score of the individual subject was used as point of departure. The subject's mean score is the mean of his weighted scores on the sub-tests. The mean for the Verbal part and the mean for the Performance part were computed separately and kept separated. There were, therefore, 2 mean scores for each subject's test, a Verbal mean and a Performance mean. The deviation of each sub-test's weighted score from the mean was then calculated, for the Verbal sub-tests from the Verbal mean, for the Performance sub-tests from the Performance mean. The deviations thus obtained were given signs :

0	stands for a plus or minus deviation of 1.5 or less.				
+, —	„	„	„	„	1.6 to 2.5.
++, — —	„	„	„	„	2.6 and more.

Each of the five signs was counted for every sub-test and every subject, and added up separately for the 3 groups. The result showed the direction in which each sub-test tended to deviate from the mean in each of the 3 groups.

The signs were first used by Wechsler himself, but attention has to be drawn to the fact that Wechsler left a gap between 2.5 and 3, and that with a view to enabling direct comparison, the gap had to be closed by making the ++ and — — signs cover the range from 2.6 onwards.

For the ranking order of difficulty for the 5 Verbal and 5 Performance sub-tests (Vocabulary excluded on the Verbal side) each subject's weighted scores were arranged in numerical order and ranked 1 to 5. The ranks for each sub-test were added up for each group separately and averaged. The 5 Verbal and 5 Performance means were then again arranged in numerical order.

For setting up a ranking order of difficulties of the single items constituting a sub-test the complete failures on each item were counted and added up, the criterion for "complete failure" being that the subject had produced no scorable response for the item either through not reaching a solution at all, reaching a wrong solution, or overstepping the time limit.

For each sub-test the lowest full scale I.Q. at which no complete failure occurred is given. This does not include group A in view of the fact that their I.Q. was lowered by their mental impairment and did not give the true picture.

An overall inspection of the deviation table (Table I) shows that group A owing to its mixed composition, did not give the specific scattergram of any disorder, but that the two well-known features common to all mental disorders stand out clearly: heavy scatter in both directions with Information and Vocabulary well preserved. Comprehension and Blocks vary, Arithmetic, Picture Arrangement and Digit Symbol show tendencies towards minus

RESULTS AND DISCUSSION.

TABLE I.—*Sum of the Deviations from the Individual Mean Score, Mean for Verbal and for Performance part Calculated Separately. Vocabulary and Digit Span not included in Verbal Mean.*

o = + or — deviation of 1.5 or less.
 +, — = deviation of 1.6 to 2.5.
 ++, — = deviation of 2.6 and more.

	Group A.					Group B.					Group C.				
	--	-	o	+	++	--	-	o	+	++	--	-	o	+	++
Information	0	1	9	2	8	1	1	16	1	1	1	2	15	2	0
Comprehension	4	2	7	4	3	1	1	16	2	0	0	1	14	2	3
Arithmetic	9	2	4	3	2	3	2	13	2	0	7	1	9	2	1
Similarities	1	4	11	3	1	0	5	10	4	1	0	4	12	2	2
Vocabulary	0	0	(5)	(4)	(4)	0	(1)	(12)	(3)	0	0	(1)	(13)	(5)	(1)
	14	9	31	12	14	5	9	55	9	2	8	8	50	8	6
Picture															
Arrangement	7	5	7	1	0	3	3	12	2	0	4	3	12	0	1
Picture															
Completion	0	1	7	3	9	2	1	10	3	4	0	1	13	4	2
Blocks	2	3	10	4	1	0	5	11	2	2	1	1	13	3	2
Object Assembly	0	1	9	5	5	1	1	14	2	2	0	2	11	4	3
Digit Symbols	6	7	4	3	0	4	6	9	0	1	0	8	11	1	0
	15	17	37	16	15	10	16	56	9	9	5	15	60	12	8

TABLE II.—*Distribution of Signs.*

	Verbal (without Vocabulary).	Performance.	Total.
Sum o :			
A	31	37	68
B	55	56	111
C	50	60	110
Sum -- :			
A	14	15	29
B	5	10	15
C	8	5	13
Sum - :			
A	9	17	26
B	9	16	25
C	8	15	23
Sym + :			
A	12	16	28
B	9	9	18
C	8	12	20
Sum ++ :			
A	14	15	29
B	2	9	11
C	6	8	14

scatter, Picture Completion and Object Assembly towards the plus side. The sum total of o deviations from the mean is only 68 for group A against 110 and 111 for the two other groups (Table II). If Verbal and Performance part deviations are taken together there is hardly any difference between group B and C, but if the two parts are considered separately it appears that group C scattered more on the Verbal and group B on the Performance part.

TABLE III.—*Ranking Order of Sub-tests.*

	A	Group mean rank.	B	Group mean rank.	C	Group mean rank.
Verbal						
part 1	. Information	. 1.75	. Information	. 2.3	. Comprehension	. 2.2
2	. Similarities	. 2.9	. Similarities	. 2.67	. Similarities	. 2.45
3	. Comprehension	. 3	. Comprehension	. 2.9	. Information	. 2.83
4	. Arithmetic	. 3.4	. Arithmetic	. 2.95	. Arithmetic	. 3.1
5	. Digit Span	. 3.9	. Digit Span	. 4.1	. Digit Span	. 4.43
Performance						
part 1	. Picture Com- pletion	. 1.93	. Picture Com- pletion	. 2.47	. Picture Com- pletion	. 2.35
2	. Object Assembly	. 2.02	. Object Assembly	. 2.57	. Object Assembly	. 2.35
3	. Block Design	. 3.03	. Block Design	. 3	. Block Design	. 2.9
4	. Picture Arrange- ment	. 3.88	. Picture Arrange- ment	. 3	. Picture Arrange- ment	. 3.55
5	. Digit Symbols	. 3.98	. Digit Symbols	. 3.87	. Digit Symbols	. 3.8

More — — deviations in Arithmetic and ++ deviations in Comprehension mainly account for C's higher verbal scatter, more — — deviations in Digit Symbols and overall scatter in Picture Completion mainly for B's higher Performance scatter.

In group C 13 subjects scored higher in the Performance part of the test than in the Verbal part, one subject scored equally high in both parts, 6 scored higher on the Verbal side. In group B 13 subjects scored higher in the Performance part, 3 scored equal, 4 scored higher on the Verbal part. In group A 5 subjects scored higher on the Performance side, one scored equal, 14 scored higher on the Verbal part. These results tend to show the greater vulnerability of the Performance sub-tests in mental disorders.

In both groups where there was an equal number of men and women, i.e., A and C, the men gave consistently a lower number of complete failures. No satisfactory explanation could be found for this fact in the distribution of I.Q., and one feels tempted to speculate that the men were either more persistent or more reluctant to admit failure, did not give up, and were likely to reach some solution even if it was a feeble one. For women to admit ignorance may not have the same meaning. They may less trust their powers and fear ridicule more. Apart from this general tendency some items seemed to be failed more frequently by men, others by women.

VOCABULARY.

The vocabulary proved once more its well-known invulnerability. The majority of group A scored well above the mean, and none of them deviated on the minus side. This fact, in itself, showed clearly the mental impairment of the group irrespective of specific diagnosis. As could be expected, the majority in the two other groups had either no deviation or a tendency towards +.

Two subjects, one in group B and C respectively, scored below the mean. This does not appear to be a frequent occurrence in the Wechsler test, but if it happens an exploration of the patient's school history seems advisable. H. J.

Eysenck and co-workers (5), who subjected their neurotic population to the Mill Hill Vocabulary and compared the results with those of the Matrix test, found that patients with hysterical conversion symptoms, with hysterical attitudes to their symptoms, and those with unskilled background showed "significantly lower results on the Vocabulary test than on the Intelligence test."

In the anglicized version the order of presentation of the vocabulary cards seemed to agree fairly well with the degree of difficulty. Success on more difficult words was frequently connected with profession and interests (e.g. "aseptic" for a nurse, "vesper" for a religious person). "Armoury" was usually failed by women and rarely by men. Needless to say that the Vocabulary sub-test, although not specially designed for the purpose, has, like any list of words, the qualities of a word association test, and that it is, therefore, as well to be on the look-out for unusual definitions, long hesitations, side-remarks, misinterpretations and misreadings. A woman patient who had lost her whole family in a night of the blitz read and defined "ballast" as blast.

INFORMATION.

This sub-test ranks first with group A and B and third with C (Table III). The most difficult items for B and C were ethnology, apocrypha, habeas corpus, the easiest, New York, Prime Minister, rubber, thermometer. In group A no failures occurred in heart, New York, Hamlet, otherwise there was a wide spread of failures which occurred only once. Wherewith, exactly, a failure would occur in that group was unpredictable, although the sub-test itself, together with "Vocabulary," is the least vulnerable. Highly educated persons may attribute Faust to Marlowe. It is thought that the answer merits full score. Young people with schooling perhaps interrupted by war may not be relied on to know how many weeks there are in a year, whereas in an older person failure to answer this question is suspicious. Aeroplane, South Pole, Koran were failed more frequently by women than by men.

(In the ranking order of difficulty for the single items the "most difficult" items are given in the order difficult to easier, the "easiest" items in the order easy to more difficult. Ties are indicated by an oblique stroke.)

COMPREHENSION.

Lowest full scale I.Q. for no complete failures, 98.

	A	B	C
<i>Most difficult</i>	deaf, land, theatre/ marriage, woods	deaf, marriage, woods, land	deaf, woods, marriage/land
<i>Easiest</i>	laws, shoes	laws/bad company	envelope, taxes
<i>No failures</i>	envelope, bad company, taxes	envelope, shoes	envelope, bad company

Although direct comparison of results is not conclusive owing to the differences in intellectual level it may be worth noting that groups A and B had the same number of complete failures and the controls only half the number. On the ranking list (Table III) Comprehension ranks first with group C and third with the two other groups. In Rabin's (2) American ranking order Comprehension also holds first place for his controls. If one takes Comprehension to be a test of what is usually called common sense and further considers that it could be solved without complete failures down to an I.Q. of 98 the fact that group B tended to do worse than the controls may be of significance.

"Marriage" was failed more frequently by men than by women, the latter finding at least the answer "bigamy." That woods can be so extended that one cannot see the end of them through the trees may be beyond the experience of many people in this country.

Similarities.—Lowest full scale I.Q. for no complete failures, 125.

	A	B	C
<i>Most difficult</i>	wood, fly, praise, air	fly, wood, poem, praise	fly, praise, wood, air
<i>No failures</i>	orange, coat, waggon, newspaper	orange, coat, dog, wagon	orange, coat, dog, wagon, newspaper.

This sub-test holds second rank in all the groups, although the deviations from the mean are more frequent in A and B. The high rank of this test in group A is in disagreement with the usual findings, but may be explained by the mixed composition of the group. The few schizophrenics within the group scored low with one exception.

It will be generally agreed that Similarities is a test of verbal concept formation. Kasanin and Hanfmann in their "Experimental Study of Concept Formation in Schizophrenics" (6) arrived at the conclusion that only their controls with university education had reached the highest level of conceptual thinking. The diagnostic value of the sub-test is, therefore, greatest with patients who are known to have had a high intellectual level. The appearance of concrete thought (e.g. a dog and a lion, both have four legs) is inconclusive with people of normal or low educational background, but suspicious with subjects of superior education.

Arithmetic.—Lowest full scale I.Q. for no complete failures, 112.

	A	B	C
<i>Most difficult</i>	8 men, train, car, 7 stamps	train, 8 men, car/walk	train, walk, car/7 stamps
<i>Easiest</i>	sugar	7 stamps	walk
<i>No failures</i>	item 1	1, 2, 3, 4	1, 2, 3

The achievement of group C was much worse than that of group B. Seven of them had a — — deviation against only 3 in group B. In Rabin's study (2) Arithmetic ranks last for the controls, and Rapaport (4) excludes it from the

computation of the verbal mean. Should one assume that a — — deviation in Arithmetic is fairly normal and that group B had a tendency to do better? Or has the higher number of women in the group who were mostly housewives or in business influenced the results? It appeared that subjects who through their occupation, e.g. clerk, shop assistant, housewife, had constant dealings with figures or cash solved items 1 to 6 or 8 quickly and correctly, irrespective of their achievements in the other sub-tests. One of these subjects, I.Q. 91, Information score 4, solved items 1-8 without difficulty. Continuous practice then seems to be an important element. The same does not apply to the last 2 items which nobody with an I.Q. under 112 could solve. Duller people got muddled up quickly, but if encouraged to try for a while frequently made useful remarks "You should have my hubby here," "My boy who goes to the Grammar School is good at figures," "I always hated arithmetic." For item 9 they sometimes arrived at the absurd solution that less men are needed to finish a job in half a day than in 6 days. No significance other than dullness can be attached to it, while the same absurdity if it comes from a graduate and he does not correct it immediately is serious in implication. From a diagnostic point of view the way the last two items are tackled is always interesting.

A common mistake for item 6 was $1\frac{1}{2}$ instead of $1\frac{1}{4}$, and it was more frequent among men than women.

Digit Span.

This sub-test ranks last in all three groups and last but one in Rabin's classification. Wechsler states "a score range of 5 to 8 digits forward and 4 to 6 backward includes 90 per cent. of the adult population" and "span generally correlates very poorly with all other tests of intelligence." From the first statement it appears that in the higher I.Q. ranges a — — deviation (2.6 or more) from the mean verbal score is almost unavoidable. To give an example: in the age group 25 to 39 a Verbal I.Q. of 139 is achieved by a weighted score of 80. The mean for the 5 sub-tests would be 16. A weighted digit span score of 16 corresponds to a digit span raw score of 16, i.e. 8 forward, 8 backward, or 9 forward, 7 backward, or 10 forward, 6 backward. All of these spans are according to Wechsler's figures outside the range of 90 per cent. of the adult population, and the remaining 10 per cent. who may achieve them are not necessarily to be found amongst the highest I.Q. ranges owing to the low correlation of the test with general intelligence. The higher the I.Q. the greater is, therefore, the chance of a — or — — deviation for the digit span sub-test. As the low digit span score in its turn lowers the verbal mean, accounts frequently for a ++ deviation in another verbal sub-test and thus distorts the whole scatter picture, it seemed advisable to exclude it from the computation of the mean weighted score. For diagnostic purposes a — — deviation in the digit span, particularly in the higher I.Q. ranges is of little significance, and it is best to consider the absolute number of digits repeated.

Five to 7 forward and 4-5 backward were the most frequent achievements

in all three groups. The differences between forward and backward in favour of forward were—

Group A	mean = 2.3158	(SD 1.3)	groups A/C :
„ B	„ = 2.05	(SD 1.2)	<u>7</u>
„ C	„ = 1.6667	(SD 1.2)	c.r. = .4 p = >.1

It appears that the difference between forward and backward (merely suggestive) may be more important than the absolute number of digits repeated, and that it should not exceed two in favour of forward. A higher span backward than forward is an oddity and always needs investigating, as it is obvious that in order to reverse a series of figures one has first to remember the original sequence. Although the groups under discussion are small there seemed to be some evidence in support of Rapaport's (4) finding that a very high digit span occurs in schizophrenics and schizoids. In group A 4 patients giving 7, 8, 8, 9 forward respectively were acute schizophrenics, 2 more with 9, 9 forward and 6, 8 backward were schizoid.

Object Assembly.

This performance sub-test ranks second for groups A and B and ties for first place with Picture Completion for group C (Table III). There is relative stability in all the groups with tendency towards a plus deviation. No complete failure occurred in any of the groups. It was, therefore, thought that differences, if any, ought to show in the time taken for the execution of each item. The total time taken by group B was considerably above the time of the two other groups. A direct comparison, however, did not seem satisfactory owing to the stronger representation of the group in the I.Q. range under 116. The sums of the time taken for each of the three items were; therefore, converted into percentages of the total time taken by each group for the three items.

	Item I "Manikin."		Item II "Profile."		Item III "Hand."		Total Time in seconds.
	Time in seconds.	%	Time in seconds.	%	Time in seconds.	%	
Group B	411	13.5	1332	44.5	1260	42	3003
„ A	345	15	815	35	1165	50	2325
„ C	334	15.5	762	36.5	993	48	2089

From these figures it appears that there was hardly any difference between groups A and C, and that most time was taken by "Hand." Group B showed a different time pattern, they were slightly quicker over the "Manikin" but took more time for "Profile" than for "Hand." A close scrutiny of the data seems to point in the direction that in the lower I.Q. ranges of all groups there was a tendency towards a greater difference between the time taken for "Profile" and for "Hand" and/or a longer time was needed for "Profile" than for "Hand." The reason may be that average and duller people attack this sub-test by a trial-and-error method. Recognition of what the whole figure is meant to be varies from subject to subject and is usually slow. This procedure

makes for a longer performance and irregularities in the time relationship between "Profile" and "Hand."

Picture completion.

Lowest full scale I.Q. for no complete failure, 115.

" " if item 14 excluded, 98.

	A	B	C
<i>Most difficult</i>	eyebrow, shadow, diamond/arm/tie/bulb	eyebrow, shadow, water/bulb	eyebrow, shadow, bulb/arm
<i>No failures</i>	nose, moustache, ear, tail, knob, second hand	nose, moustache, second hand	moustache, diamond, stacks

This sub-test ranks first amongst all the groups (Table III). Group A deviated strongly —+ over the mean performance score, group C was stable with tendency towards +, group B showed some slight — — scatter. Group B's greatest divergence in the number of failures occurred on the "crab" (5 against 2 controls), and the "diamond" (4 against 0). Their minus tendency is interesting. Rapaport (4) considers failures in this sub-test as denoting impaired concentration. It rather seems from the present data that the B group's failures point to lack of visual balance and an inability to see the obvious. The latter could be brought into line with their relatively poor achievement in Comprehension where they showed some lack in common sense, and both tendencies would link up well with the Rorschach characteristics of a series of duodenal ulcer and of psychogenic rheumatism patients (7, 8) who gave an unusually low percentage of popular responses, those being responses given by every healthy individual and showing the capacity for thinking on common lines.

The missing eyebrows on item 14 were so rarely appreciated that the picture does not seem to be of much value. The base thread on the "bulb" was failed more frequently by women than by men.

Blocks.—Lowest full scale I.Q. for no failures, 114.

	A	B	C
<i>Most difficult</i>	6/7	6, 7	7, 6
<i>Easiest</i>	2/4	5	5
<i>No failures</i>	1, 3	1, 2, 3	1, 2, 3, 4

This sub-test ranks third amongst the performance sub-tests for all groups. Performances in all groups were relatively stable with half or more subjects in each group showing no deviation from their mean. Fourteen out of the 20 subjects in group B failed item 6, 9 failed item 7. The other two groups showed no difference in the number of failures between item 6 and 7. There is some reason to believe that the significance of a failure on item 7 is different from one on item 6. It will be remembered that pattern 6 consists of diagonals on a square ground. Shapiro (9) pointed out that difficulties might be experienced if there was incongruity between figure and ground. Rapaport contended that item 6 mainly needed acuity in visual organization. If this proved true

it would appear that group B's visual organization was less developed than the other groups.

Only subjects in group A attempted to build the square patterns with a wrong number of blocks in the row.

It may be queried whether Wechsler was wise in the selection of the colour scheme red/white. The red/colour shock on the Rorschach cards is a well-known phenomenon and Rorschach workers attach a different meaning to the choice of concepts in red and in other-coloured areas of the blot. Although colour dynamics are so far insufficiently understood, few psychologists would deny that red is a "hot" colour. Once a manic patient, not included in the series, refused to handle the red Wechsler blocks—"I can't work with them, they give me a headache." She was allowed to build the patterns in blue/yellow. After completion of the Wechsler test she was given the Mosaic test. She immediately started with the red pieces and made, as many manics, an entirely red and white pattern with red dominant.

Digit symbols.

Group C had no — — deviation and more than half of the subjects achieved 0 scatter, against only 4 subjects with 0 deviation in group A. The high vulnerability of this sub-test testing visual motor-coordination is well-known and the heavy scatter of group A is not surprising. The definite minus tendency in group B, however, is an interesting feature. As the achievement in Digit Symbols is supposed to be sensitive to age, the — — deviations were inspected with regard to the subject's age. It appeared that in group A the 6 — — deviations were given by patients aged 31 (female), 35 (male), 46 (male), 47 (female), 48 (female), 49 (male), thus lending some support to the ageing theory. In group B the ages were 26 (male), 30 (female), 37 (female), 40 (male). The hypothesis is attractive that this test needing essentially a smooth interaction between mind and body would be hard for the group because it may be the lack of this smooth interaction which accounts for their symptoms, but the group was too small and too strongly mixed to allow for any definite conclusions.

This sub-test ranks last amongst the performance sub-tests for all groups. It ranks first for Rabin's American controls. As they were student nurses who presumably were all very young, the age factor may account to some extent for the discrepancy.

Picture arrangement.

Lowest full scale I.Q. for no complete failures, 106.

Wechsler states that this sub-test correlates poorly with the other tests of the scale. On Rabin's list of controls it ranks last but one, on Magaret's (3) list it ranks last. Rapaport, who used the deviation from the Vocabulary score as a measure of scatter found that his control group consisting of highway patrol men did not do better than his mental patients. He explained it by their rural background which made them unsuitable for that rather sophisticated test. This is contested by Estes (10), who tested 102 university students. They, too, showed a minus deviation.

That in the present investigation all groups scattered with a definite ten-

dency to — and — — deviations, that no failures occurred down to an I.Q. of 106, that 6 controls in the I.Q. range of 120 and more failed one or more items, and the fact that for all groups this sub-test ranks last but one on the ranking list of the performance sub-tests (Table III), points in the direction that the sub-test might have a poor correlation with other tests purporting to measure intelligence. Another disadvantage of the test is that the items "flirt," "taxi," "fish," can be executed correctly with little or no understanding of their meaning. The pictures of "flirt" are put into the right order without appreciation of the king's change of headgear. For "taxi" the correct or almost correct sequence can be achieved without realizing that the man blushes and is afraid that the situation may be misinterpreted. In "fish" a pure process of elimination makes for success, "no fish, one fish, fishing, 2 fish . . ." and what the diver has to do with the story is not understood at all.

What exactly are the qualities which are needed to achieve success and see meaning in this sub-test is not easy to assess. Wechsler suggests "social alertness," Rapaport "the ability to plan ahead." Whenever it was possible to check on the social behaviour of the successful subjects they appeared to be pliable people unlikely to behave "like a bull in a china shop." Wechsler's "social alertness" seems to express the quality well, but one may perhaps also call it "tact." It would be unwise to state without reservation that the converse applies to subjects of superior intelligence who fail at one or more items.

Although it might be advisable to exclude the sub-test from the computation of the performance scores' mean, it might be a mistake to discard it altogether. Bearing all its shortcomings in mind it can, besides its social implication, be used with advantage as a projection test if the subject is encouraged to tell the story as he sees it. For instance, for "taxi" the misinterpretation of the bust as a living woman is a schizophrenic feature, a story "he has stolen the bust and turns round if there is a police car behind him" has a paranoid tinge, "he puts it safely into the corner because he is afraid he may break it" may be an obsessional answer. That in the control group 4 women and no men failed "taxi" also tends to show that the familiar process of identification is at work. A man of 31 with marked homosexual trends and great difficulties in his married life blocked completely at the sight of the solitary female figure in "flirt" and was unable to produce any coherent story in spite of an I.Q. of 136.

Deterioration formula.

Wechsler distinguished between two types of sub-tests :

(1) Those where the abilities measured declined relatively little with age. He called them "hold" tests. They are : Information, Vocabulary, Picture Completion, Object Assembly.

(2) Those where the abilities declined considerably with age. He called them "don't hold" tests. They are : Digit Span, Arithmetic, Block Design, Digit Symbol.

$$\text{His formula} \quad \frac{\text{"hold" minus "don't hold"}}{\text{"hold"}}$$

if corrected for age, is supposed to give a measure of excess deterioration. Wechsler suggests (11) that an excess of 10 per cent. represents a possible impairment and an excess of 20 per cent. definite evidence of deterioration.

The formula corrected for age was applied to the groups under consideration. The results were :

	= or + on "don't hold."	Loss under 10 per cent.	Loss 11 per cent. to 20 per cent.	Loss 21 per cent. and more.
Group A	4 .	2 .	6 .	8
„ B	3 .	10 .	1 .	6
„ C	3 .	4 .	9 .	4

It will be seen that although group A has the greatest number of cases above 21 per cent., there are 6 cases with no apparent deterioration, and that group B has 13 cases with no apparent deterioration against 7 in the control group. The main reason for this is the inclusion of "Arithmetic" in the "don't hold" tests in which group B did much better than group C. It follows that the formula cannot be used indiscriminately and that the results obtained must be carefully scrutinized.

SUMMARY.

Three groups of 20 subjects each were tested. The mean of their weighted scores and deviations from the mean were computed for each sub-test. Verbal and Performance part were kept separated. The scattergrams of each group were discussed. Ranking lists for the sub-tests and for the items were given. Sub-tests, items and failures were discussed.

On the ranking list for the verbal sub-tests Comprehension ranks first for the controls and third for the other two groups. The ranking order of the Performance sub-tests is the same for all groups in spite of differences in scatter.

Information.—The changes introduced with the anglicized version were not found to have affected the scatter picture.

Arithmetic.—Poor achievements of the control group made the diagnostic significance of a — — deviation doubtful.

Picture Arrangement.—The data tend to show that success or failure do not depend on intellectual abilities alone. The suggestion is made to exclude the sub-test from the computation of the mean, but not to discard it because of its possibilities as a projection test and its social implication.

Digits.—The sub-test was found to distort the scattergram and was excluded from the computation of the Verbal mean. The absolute number of digits repeated was found to be of less diagnostic significance than the difference between digits forward and backward.

Deterioration formula.—According to the formula the control group had fewer cases with no apparent deterioration than group B, and it seems that the formula has to be used with caution.

Group A (under treatment or investigation in the mental sphere) :

Owing to its mixed composition the group gave no specific scattergram but the two well-known features common to all mental disorders were confirmed; heavy scatter, Vocabulary and Information well preserved. The Verbal part

proved to be more stable than the Performance part. Comprehension and Digit Symbols were the most vulnerable sub-tests if Arithmetic is excluded. The group's difference between Digits forward and backward was 2.3 in favour of forward, against 1.6 in the control group.

Group B (psychosomatic disorders) :

Scatter for the group as a whole was not severe, and the sum total of o deviations from the mean was the same as for the control group. The tendencies of the scatter differed, however, from group A as well as from group C. The group was better in Arithmetic than the other 2 groups, but poorer than the controls in Comprehension, Picture Completion and Digit Symbols. The time pattern in Object Assembly and the ranking of failures in Blocks differed from both the other groups, and the difference between Digits forward and backward was half-way between them, but, on the whole, it can be said that the group seemed nearer to group C, the controls, than to group A.

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APPENDIX.

SUB-TEST " INFORMATION " (*anglicized version*).

1. Who is Prime Minister ?
2. Who was Prime Minister before him ?
3. What is a thermometer ?
4. From what is rubber obtained ?
5. Where is New York ?
6. How many pints make a quart ?
7. How many weeks are there in a year ?
8. What is the capital of Italy ?
9. What is the capital of Japan ?
10. What is the average height of a woman ?
11. Who invented the aeroplane ?
12. Where is Brazil ?
13. How far is it from Paris to New York ?

14. What does the heart do ?
15. Who wrote Hamlet ?
16. What is the population of Great Britain ?
17. What is the date of Armistice Day ?
18. Who discovered the South Pole ?
19. Where is Egypt ?
20. Who wrote *Pickwick Papers* ?
21. What is the Vatican ?
22. What is the Koran ?
23. Who wrote "Faust" ?
24. What is Habeas Corpus ?
25. What is ethnology ?
26. What is the Apocrypha ?

SUB-TEST "ARITHMETIC" (*anglicized version*).

1. How much is four shillings and five shillings ?
2. If a man buys six shillings worth of stamps and gives the clerk 10s., how much change will he receive ?
3. If a man buys 7d. worth of stamps and gives the clerk 2s., how much change will he receive ?
4. How many oranges can you buy for 3s. if one orange costs 4d. ?
5. How many hours will it take a man to walk 24 miles at the rate of 3 m.p.h. ?
6. If a man buys 7 2d. stamps, and gives the clerk half a crown, how much change will he receive ?
7. If 7 lb. of sugar cost 2s. 6d., how many pounds can you get for 10s. ?
8. A man bought a second-hand car for $\frac{2}{3}$ of what it cost new. He paid £400 for it, how much was it worth new ?
9. Eight men can finish a job in 6 days, how many men will be needed to finish it in half a day ?
10. If a train goes 150 yards in 10 seconds, how many feet can it go in $\frac{1}{5}$ th of a second ?

SUB-TEST "VOCABULARY" (*order of presentation according to anglicized version*).

- | | | |
|----------------|--------------------|----------------|
| 1. Apple | 15. Belfry | 29. Vesper |
| 2. Donkey | 16. Nitroglycerine | 30. Catacomb |
| 3. Dollar | 17. Tint | 31. Chattel |
| 4. Join | 18. Ballast | 32. Harakiri |
| 5. Gamble | 19. Microscope | 33. Dilatory |
| 6. Fur | 20. Armoury | 34. Spangle |
| 7. Cushion | 21. Fable | 35. Stanza |
| 8. Diamond | 22. Espionage | 36. Flout |
| 9. Nail | 23. Seclude | 37. Mantis |
| 10. Bacon | 24. Recede | 38. Aseptic |
| 11. Nuisance | 25. Imminent | 39. Traduce |
| 12. Guillotine | 26. Pewter | 40. Moiety |
| 13. Cedar | 27. Plural | 41. Proselyte |
| 14. Brim | 28. Affliction | 42. Amanuensis |

FRONTAL BLOCK.

SOME OBSERVATIONS ON THE EFFECTS OF LOCAL ANAESTHETIC INJECTIONS
INTO THE CEREBRAL HEMISPHERES OF RABBITS
AND PSYCHOTIC PATIENTS.

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THERE appears to have been little investigation of the effects of local anaesthetic infiltration of the brain. Occasional reports mention the possibility of such procedures for diagnostic purposes.

The following two sections of this paper are preliminary reports.

ANIMAL EXPERIMENTS.

With the collaboration of W. V. Macfarlane, three rabbits were first craniectomized over the greater part of the convexity of the cerebral hemispheres. Rabbit C sustained some meningocortical injury and died on the 15th day.

Rabbit A.—On the 9th day after operation three injections were made into the left hemisphere. The first, 0.05 c.c. half per cent. percaine, was injected about the mid-hemisphere. This resulted in a moderate hemiparesis lasting 10 minutes, unassociated with any other detected change. When the rabbit appeared to be normal again, 0.075 c.c. of procaine base in oil were injected anteriorly in the same hemisphere. As there was no detectable change, a further 0.1 c.c. of the same base was injected about 5 mm. further back. Again there was no detectable change in the rabbit's behaviour.

On the 12th day the right hemisphere was injected about the midzone with 0.15 c.c. procaine base in oil. There was no detected change in 10 minutes. A further 0.15 c.c. was infiltrated in the same region. Shortly after the rabbit defaecated. After 5 minutes the rabbit micturated and showed some weakness of the left foreleg. Liveliness decreased; there was no running, but walking, in circles to the left, appeared in another 7 minutes. These changes only remitted slowly, and there was some left hemiparesis and a tendency to circle to the left still noticeable after 24 hours.

On the 19th day the right hemisphere was infiltrated with 0.1 c.c. of 1 per cent. decicuin (containing India ink) about the midzone. A left hemiparesis and deviation of the head to the left soon developed. The rabbit remained lying, but could right itself if turned over. After 5 minutes it was sitting, looking to the left, twitching the ears. It was very responsive to noise, and the

left foreleg was still obviously weak. After another 5 minutes it was jumping about and more lively. Recovery ensued by 15 minutes after the injection.

On the 23rd day the left hemisphere was infiltrated with decicain (0.2 c.c. of 1 per cent.). There was again a hemiparesis, though not so severe. Recovery followed in 10 minutes. 0.1 c.c. of 1 per cent. decicain were injected on the left side on the 30th day. Hemiparesis was obvious in 2 minutes, together with a reduced response to pain on the right. After 10 minutes the rabbit was able to stand again, but still with a right-sided weakness. In another 10 minutes full recovery was apparent. The rabbit was then killed, and the head placed in fixative.

Autopsy showed no abnormality. The rabbit had remained well nourished, and throughout the course of the month had shown no abnormality except those noted above.

The head was dissected after fixation. The only significant gross change was the presence of a small amount of blood in the cisterna pontis and the right frontal pole. There was some subarachnoid India ink. Microscopic sections were cut of the hemispheres. In one section the last needle track was apparent with fresh red cells and India ink particles not yet phagocytosed. In the adjacent subarachnoid space there were fresh red cells, not clotted, and India ink. At more remote points there were some (intracellular) India ink particles but no noticeable increase in the fibrous tissue of the pia arachnoid.

Rabbit B:—On the day after operation five injections were made in the left hemisphere. Each was of 0.05 c.c. of 2 per cent procaine, and each placed a little further caudal. No detectable abnormality was found. Between each injection the rabbit ran around the room with as much vigour as before.

On the 9th day an injection of 0.05 c.c. half per cent. percaine was without effect. This was followed by one of 0.075 c.c., which produced a slight dragging of the right legs. Recovery was rapid. Then the rabbit was injected with 0.2 c.c. half per cent. percaine in the mid-hemisphere. Within 30 seconds rapid running movements occurred, which continued when the rabbit fell over. There was no clonic element. Within another minute complete flaccidity developed with pilo-erection. Respiration stopped, and the heart slowed, and was recorded at 50 per minute. It was irregular. Artificial respiration was instituted, and at no stage was cyanosis allowed to develop. The pulse rate started to accelerate 10 minutes after the injection. Fifteen minutes later a few irregular breaths occurred spontaneously, and in another 4 minutes regular respiration was re-established. This changed to a tachypnoea for about 10 minutes. During this time there was some rigid extension of the legs, with movements, however, in response to local pain. There were occasional twitches of the legs. Forty-five minutes after the injection the rabbit appeared to be as though recovering from a general anaesthetic. There were purposive avoiding movements, and it could be aroused, but appeared to go to sleep again the moment the stimulus was stopped. The speed of the onset of the disturbance and the severity thereof suggests that the injection was intraventricular. In 12 hours the rabbit had recovered.

On the 12th day 0.15 c.c. of 5 per cent. Stovaine were infiltrated into the

right hemisphere. A paresis was definite in 1 minute, and then the rabbit fell on its side but made vigorous running (righting) movements. Pilo-erection occurred. The righting element was easily demonstrated. If the head was held vertical no particular leg movement occurred, but if the head was allowed to fall to the left movement of all legs occurred. The rabbit could not get up when lying on its left side. It would not remain lying on the right side.

On the 10th day 0.1 c.c. of 1 per cent. decicain was injected (with India ink). An almost complete left hemiparesis quickly developed. The rabbit lay on the floor curled up convex to the right, with only occasional movements of the left limbs. It was unable to stand, but could move a little on the floor if annoyed. For the next 3 minutes it lay, head turned to the right, forelegs spread on either side, but the hind legs to the left. Righting occurred to this position if displaced, but was not always successful at the first attempt. After 10 minutes the rabbit was able to lift the trunk off the floor and advance. It was able to run after another 10 minutes, but remained very docile and placid to handling and examination.

On the 23rd day 0.1 c.c. of 1 per cent. decicain (with India ink) was given posteriorly with no detected effect. This was repeated on the 30th day, but a deliberate attempt was made to infiltrate it into the ventricle (left). A right hemiparesis ensued rapidly, breathing stopped, and the heart continued beating for 2 minutes. No attempt at resuscitation was made.

Examination of the head after fixation revealed a little subarachnoid blood and India ink. On the left side there was a well-organized needle track with almost complete absorption of blood, and well-marked phagocytosis of the India ink. This was probably due to the injection 7 days before death. On the opposite side in the same section there was a smaller portion of an older lesion, again with India ink. There was also subarachnoid ink, and in places some increase in the fibrous network with small traces of cellular debris, which suggested organized subarachnoid blood.

Rabbit C:—Nothing new was observed during three injections of procaine base in oil. Dissection of the head after fixation showed extensive subarachnoid clots, in the sulci, especially of the right temporal lobe, and around the brain stem. Microscopically there were red cells, cellular debris and delicate strands of invading connective tissue. The appearances were consistent with a lapse of 3 days since the bleeding from the last injection.

While these experiments were being carried out (1947) the papers of Soulaïrac and Barbizet (1946) became available. Their results are comparable, though carried out on rats.

The purpose of these experiments was to determine the safety, or otherwise, of local infiltration, the most suitable (and safest) agent to use, and the feasibility (or otherwise, of the procedure in man. The region particularly of interest was the operative field of prefrontal leucotomy. If it were possible to infiltrate this region with safety a diagnostic test could be undertaken before the irrevocable surgical incision.

Risks.—From these experiments two risks became apparent. The first is that of respiratory paralysis, but this can be tided over by artificial respiration.

The second is the injury inflicted by the injection. Injury in the proposed site, the field of operation for prefrontal leucotomy, does not matter if this is the ultimate purpose. Provided the needle does not leave the white matter it should be as safe as the use of the leucotome. Bleeding into the subarachnoid space appears to be more serious. In the rabbits the needle was inserted blindly through the intact meninges and cortex. In man, in order to avoid this risk, part of the cortex beneath the necessary trephine would need to be coagulated. This condition obtains in cases submitted to leucotomy by the lateral blind approach (see later).

The fact that the local anaesthetic may reflux along the needle track and so enter the subarachnoid space does not appear to be important. Thus, in Rabbit A, India ink was present in the sulci and cisternae, but no respiratory paralysis or untoward event ensued. Operatively induced adhesions beneath the trephines would tend to obviate this risk.

Dose.—The approximate average weight of the three rabbits' brains used was 10 gm. The human brain weighs from 1,250 to 1,400 gm. The comparable figures for injection volume for the human brain are: 0.05 c.c. in the rabbit, 6.5 c.c. in man; and 0.2 c.c. in the rabbit, and 26 c.c. in man. Even though the rabbits were craniectomized, the dura mater was not incised.

OBSERVATIONS IN MAN.

Following the observations previously recorded it seemed that local anaesthetic infiltration of the frontal lobe was a feasible procedure. The most suitable subject for the procedure appeared to be an already leucotomized patient who had failed to respond, or who had done so temporarily. The possibility of re-operation might be thus explored. Only three such cases have been under the writer's care since 1947.

CASE 1.—This patient was 63 years old at the time of her admission in 1943. She was born in N.Z., the middle of a family of five. Her upbringing was uneventful, and she married at 27 years. There was one deceased issue. Before the onset of her illness she was always nervous and a chronic worrier.

On admission she was depressed and vaguely apprehensive of some impending calamity. She deteriorated, becoming more agitated, solitary, resenting touching or any care. By the time E.C.T. was started she was limited in conversation to "Go away!" and moaning. With E.C.T. she showed a considerable improvement, but required maintenance treatment. With too few she remained agitated and noisy, and with too many, confused, gluttonous and faulty.

After a lengthy trial of E.C.T. she was submitted to operation on 28.10.47 when a relatively conservative operation was carried out. The next day she showed no gross confusion, and any alteration in her condition was virtually undetectable. She might have been slightly less depressed but still conversed: "Take your filthy bloody hands off me. Don't come near me, take your foot off the bed." "Nurse, you haven't washed your hands." At other times she moaned and called out "Oh! Christ!" for periods of up to 30 minutes. She was not eating well, and often covered her head with sheet or blanket. There was no change in the first week, and re-operation was considered.

On the 9th day after operation a control manoeuvre was carried out. The region of the burrholes was infiltrated, with resistance and distress. She tried to pull the sheet over her head, crying and moaning, "You're putting paper on my head," cursing and abusive. An L.P. needle was then introduced into each side and the ventricle tapped on the left. All this resulted in a great deal of abuse, resistance, a little sweating, and later a little vomiting. There was no alteration

in the temperature, pulse or respiration. The abuse did not subside for 30 minutes.

On the next day the procedure was repeated, with similar distressed behaviour and assertions that I was putting paper (and this time jelly) on her head. With the L.P. needle directed towards the orbital regions (where most of the spared fibres were thought to be), 4 injections, totalling 5 c.c. of 2 per cent. procaine, were made. On the opposite side, the left, 3 injections, totalling 4 c.c., were made. Owing to restlessness no more was done. Within a few minutes the distress associated with the procedure was over, and she had the best meal she had had since operation. She would allow me to touch the bed without comment, but still resented her head being touched: "Don't touch me. Go away!" She then went on eating. There was no doubt that she was quieter, more placid, and less agitated and resistive to attention. For the first time since operation she showed disorientation sufficient to be unaware of the day (Saturday for Sunday). The temperature, pulse and respiration were unaffected.

The change is best recorded in the nurses' notes. The nurses in question were not present during the procedures and were not told of any difference between the two.

Control (12.30 to 1 p.m.).

1.30 p.m. Has looked flushed (? from exertion) and has vomited.

3 p.m. Has been quite unhappy, saying "Christ, Oh my, Oh my!" continuously.

6 p.m. Has not eaten very much tea—is very noisy and restless.

9 p.m. Has been very talkative. (Sedative.)

2 a.m. Awake again after morph. and hyoscine at 9 p.m. Monotonously repeating her earlier statements.

7.30 a.m. Would not eat much breakfast.

Actual Infiltration (at the same time of day).

1.30 p.m. Has had a good dinner.

3 p.m. Is fairly quiet but very friendly and co-operative.

4.30 p.m. Vomited.

6 p.m. Is very bright; managed some jelly for tea but would not have anything else as she thought she might vomit. Is talking rationally and is more amiable.

9 p.m. Morph. again with hyoscine.

4 a.m. Sleeping soundly still.

6 a.m. Is now awake and noisy.

9 a.m. Is very bright.

On the 11th day the wounds were re-opened and the incisions in the white matter extended. Subsequently the post-operative course was not unusual. She was muddled, and denied that she had had an operation. Her mannerisms persisted, but were by no means so gross. A fortnight after operation she was getting up, eating and sleeping well, and obviously relieved of her emotional distress. She said she felt contented and happy. On the 21st day she struck a nurse when ordered to go against her own feelings. She continued to improve for 3 months, with minor fluctuations. She became cleaner, tidier and no longer faulty, but her obsessional routine and agitation became re-established more and more. During episodes of this nature she was much less amenable to nursing care than previously.

The agitation slowly returned. Four months after operation she was tried with E.C.T. again. Three treatments made her confused, gluttonous, and faulty. This remitted in about a fortnight and she was better conducted, most of the time sitting quietly, and at times able to work provided she was not asked to do anything against her obsessions. She relapsed in another few weeks, and the treatment was repeated with the same sequence of confusion and improvement. Thereafter, for another 12 months, she continued with E.C.T. and ups and downs. When she was subject to her obsessions and agitated she was more uninhibited in her behaviour than before operation, and even at her best still inclined to edge away from people and to dislike handling things.

On 27 September, 1949, she was at her worst before or after operation. She was filthy and dirty. Screaming and abuse followed any attempt to touch

her. Left alone, she was fairly quiet, cringing, and turning her head away, not caring for her dress or person. She was unemployable in any capacity, and at times inclined to strike or push anyone in her way.

On this occasion pentothal was given intravenously (0.5 gm. in all). Until she was unconscious she was resistive and screaming abuse. With an L.P. needle the tip of the frontal horn was located on the left side. Then in front of this plane four radiating injections were made. In each 1 c.c. of 2 per cent. procaine was infiltrated. This was repeated on the right. The patient showed no upset, was never deeply anaesthetized and was returned to her bed. She had dinner in bed, and taking advantage of her improvement she was bathed in the afternoon. During the afternoon she was able to answer simple questions relevantly, and even make spontaneous comment about other patients. There was some disorientation in time and circumstance, but this may not have been new, as she was inaccessible to such questions before.

The bathing, customarily the most difficult nursing task with this patient, went smoothly.

Nurse : " Come along Mrs. — please, it's bath time."

Patient : " Oh ! Am I going to have a bath ? "

Nurse : " Yes, come along, please."

The patient went co-operatively, was quietly spoken without abuse, and even started to wash herself once. She was inclined to be fussy about the folding of her clothes. She was afterwards returned to bed and remained well behaved for the rest of the day.

Next morning she was again dirty, resistive, screaming abuse, and all real improvement had evaporated, except that she was slightly more accessible to questioning.

The procedure of the previous day was repeated, using 5 c.c. for each side. During the recovery from the pentothal there was more movement and vocal efforts than before. This settled down, but the patient remained grossly confused. She thought first that she was not married, then it was the year 1929 and her husband was at work, then she was speaking to her young daughter, and so on.

She was asked if she wanted a bath and became abusive. She quickly changed, and within a minute was pleasantly reminiscent about the past. Other fleeting and transitory evidence of her previous agitation also occurred. She was 100 per cent. faulty. On one occasion she attributed her wet bed to the fact that she had only wiped her hands there.

During the next three or four days she was incontinent, confused, but with a good deal of the pre-existing resistive and abusive conduct reappearing. The next four days were perhaps even worse, as the patient had diarrhoea. However, on 19 September improvement set in. The confusion started to clear and behaviour settled down, and in another week she was back to a level approximately that of her previous good levels with E.C.T. In one respect, the incontinence, this was not so, for this persisted for some weeks. This improvement lasted on the upgrade for about four weeks, and was then stationary for about another two months. There was then a gradual decline. At the end of the year she would only speak spontaneously on rare occasions, and was very limited in her replies to questions. She was still so obsessed with contamination ideas that she would urinate anywhere, even in her chair, provided she could avoid using the ward lavatory. She required full nursing supervision, and was still at times resistive.

CASE 2.—This 50-year-old man was admitted to a mental hospital in 1929. There appeared to have been a previous attack in 1927, treated in a private hospital. From the records little information could be obtained of the patient's upbringing. The early notes stated that he was excited, noisy, exalted, stubborn, negativistic, but with no actual aggressive conduct. He was expressing many unfinished comments on all and sundry, singing alternately hymns and ribald ditties. The initial provisional diagnosis was acute mania, and the patient continued in a grandiose exuberant frame of mind until a period of acute aggression and impulsive behaviour. This early phase was complicated by a violent haematemesis, from which he recovered uneventfully. Throughout this period and subsequently he has expressed delusional ideas that the Holy Spirit was entering his dog, that his

reproductive organs had been destroyed, and that he could faith-heal. During the subsequent years he has shown a fluctuating course. Periods when he was well conducted, though always delusional, alternated with noisy, restless and occasional aggressive episodes.

By 1947, in the better phases, he was lugubrious, solitary, with little conversational ability, but amenable to full nursing care. Early in 1948 he again passed into a restless, excited state, pacing up and down his room, violently aggressive towards the staff, and obscene in language. He would throw his excreta about the room and was frequently coprophagic. No permanent improvement was effected with E.C.T., and in this state he was referred for operation.

Operation was performed on 25 March, 1948, by the lateral approach. Return of consciousness was slow, but the next day he was eating well but had to be fed. For the next four days he was fed, and would only answer, "I don't know," sometimes preceded by some blasphemous remark. He was not incontinent until the 5th day, and then, as a result of a bout of diarrhoea, he had some trouble, and also a return of coprophagy and faeces-smearing. On the 8th day he urinated on the floor, but otherwise was clean in his habits. From the 6th day onwards he used a knife and fork and was clean in his eating. On the 14th day he was asked how he enjoyed himself in hospital, and answered, "Not bad at all."

Q. "What did they do to you?"

A. "Shoved something in."

Q. "Where?"

A. (Pointed to the scar on the side of his head.)

Q. "Did it have any effect?"

A. "It should have" (fits of laughter).

He continued to improve, he was clean and tidy and well dressed. Instead of a sowl and solemn silence he was able to smile, and pleasantly chat for short periods on simple topics. Six weeks after operation he was making his own bed and going for regular drives into town and the country.

He asked to be supplied with a tooth brush, and was able to visit a public hair-dressing saloon.

More spontaneous conversation was present after another two months and he would make quite lengthy comments. Later he was able to be employed in gardening and ward duties. He would proceed with and complete these tasks without any supervision, though in the garden and ward he kept a constant watch for any chance of a ride in the car.

In the next few months there was little change, but the patient remained, after 19 years, at a much improved level. He took care of himself, never over-worked, and was always ready for anything special.

The patient continued at this level until about the middle of 1949. From this time he started to worsen. This was a gradual relapse, punctuated by two or three noisy spells. These lasted a few days, but after they were over there was more deterioration. At the beginning of November he was sullen, uncommunicative, stalking about and glowering. Tirades of abuse and curses were his only expressions apart from grunts. He was untidy in dress, unclean in habits, and interested in his faeces again, although he was not known to be coprophagic. He was treated conservatively for 10 days but showed no improvement. E.C.T. (6) in the next 7 days produced no amelioration in his conduct; rather the confusion only added to his pre-existing symptoms.

On 26 November, 1949, the patient was anaesthetized with 0.8 gm. pentothal intravenously, and the skin over the burr-holes prepared and infiltrated with local anaesthetic. Three injections were made on each side, and totalling 2 c.c. of 4 per cent. procaine (on each side). All were in front of the previous surgical incision and radiated up, forward, and down from the burr-hole. The procedure was uneventful.

The patient was able to speak within 60 minutes from the start. He then said he had a headache, felt "dopey," and the usual "I don't know." An hour later he still felt "dopey." After another three hours he was answering simple questions without abuse or swearing. He said he still had a slight headache to insistent questioning. He remained in bed for the rest of the day.

Next morning he was up early, talkative, always on the move, walking hither and thither, and examining first this and then that. He was quite eloquent when

spoken to, but not always relevant, as his talk was disconnected. Instead of "I don't know" he changed to "I don't know; Heigh diddle dumpkin, my son John." In the morning he did the washing up, giving everything an extra polish, but missing nothing that was going on in the ward. In the afternoon he became more and more excited, over-active, singing and elated. He was put to bed.

The next day showed some return to normal. He was still over-active and without purpose, but his conversation was less erratic, and contained more "I don't know's." Conversation could be sustained for about three remarks. Although walking about he did not look very amenable, nevertheless he was, in actual fact, very obedient and co-operative, and would do whatever he was told. This trait persisted for some time. On the next day, 29 November, 1949, he was better than he had been for months. He was sensible in simple conversation, and could talk about his family at length. He took more than the usual interest in things during a drive (for him).

The next day the patient learnt his mother had died. This he took very well, but the next morning he dressed in his best and thought he was off to his mother's funeral, which had already taken place. He accepted this, but was a bit restless for the rest of the day. During the next three days he was industriously employed in his usual routine, but subsequently started to interfere with the running of the farm unless supervised. At this time he might abuse an attendant from a safe distance, and become quite childishly embarrassed when the attendant came up to him. By 17 December he was again confined to the ward. His surly manner, abuse, and aimless pacing had returned. He was again dirty in habits and untidy in dress. From the 20th to 24th he had a further noisy spell, with rowdy, abusive and pseudo-aggressive behaviour. On the 23rd he was given one E.C.T., with no benefit. His conduct, however, improved on Xmas Eve, and he continued to improve over Xmas, without further treatment. By the New Year he seemed to have returned to the level which he had been maintaining before this acute 5-day relapse.

CASE 3.—This patient was a single man, aged 23 on admission in 1947. He was the second child of a family of a well-to-do farmer. One uncle was in a mental hospital. He was very shy, though clever enough at school to matriculate, after failing twice. Soon after he became exalted, thought he was a superman, and was admitted to a mental hospital at the age of 19. He was given E.C.T., and was able to return home and work on the farm, but could not talk to people or mix with others. When he was 22 years old he began to slip again, and he was taken to Australia for insulin and further E.C.T. There was no lasting effect from these treatments.

When he first came to this hospital he was dull, very childish in talk and manner, slow in his answers, and vague and halting in talking about himself. He would often smile to himself, and show other mannerisms. Untidy and lacking drive, he would, nevertheless, do what he was told. There was a history that he had once struck his attendant recently.

After coming to hospital he settled down. Although he said he did not day-dream, he showed, in the next 12 months, that he was still thinking about a romance with a Roman Catholic girl. This day-dream was mixed up with religious and sexual ideas. When talking about these things he would turn away, with at times a curious staring look in which his eyes seemed to protrude and an odd glow pass across his face.

After about 10 months he started to get worse again. He started to spit, and said that he could not help it because he had "catarrh." He began to complain that he did not fancy the company he had to keep, and wanted to go home. Leucotomy was suggested, and the parents were agreeable. Until this could be done the patient was given 10 electronarcosis treatments, which seemed to control his spitting habits to some extent, and certainly as a result he seemed better.

The operation was carried out in February, 1949. There was some sparing of the uppermost fibres. The operation was spectacularly unsuccessful. Within a few days after the operation he would yell if the bed was touched, throw things about his room, and spit. This settled in 3 weeks, and he was then cleaner and tidier. After a few days of laughter he began to show his earlier thought abnormalities, but in a gross form, with markedly erratic conduct. He said he was about to marry the girl in question, and was in direct touch with various spirits

and the Holy Ghost. He found everything "objectionable." He would not eat with, mix with, or talk to other patients. He disliked any attempt to make him do these things. Every trait present before operation was made more obvious, including the protrusion of the eyeballs. Hatred of his father also came to the surface. The only improvement was a lessening in the number of extrasystoles which had been noted for some months before operation.

Eight weeks after operation he was getting worse. He was given a short course of intensive E.C.T., with short-lived benefit. As he had earlier improved with electronarcosis, he was then changed on to a course of 19 treatments, totalling 153 minutes. With this course, lasting 3 months, 7 E.C.T. were given. There was no lasting improvement or change during this course of treatment, and after the 10th electronarcosis 6 further E.C.T. were given. The patient then was fairly well for 3 weeks. He then worsened again, and in the next 6 weeks received 12 E.C.T. with benefit. These treatments were given whenever his conduct became unruly, and not to any plan.

On 15 and 16 October he was visited by his parents. By the evening of the 17th he was noisy, demanding to go home, over-active, and difficult to cope with. He settled down for the night with sedatives, and was still quiet next morning. On this morning he was softly spoken and hesitant in replies. He was preoccupied with religion, saying he could see the Ghost (Holy and also "not Christly" ones) in the outline of trees and bushes. He also accused Roman Catholics of drinking.

The infiltration was carried out on the morning of the 18th. The patient was given 0.8 gm. of thiopentone. Two infiltrations, each of 2 c.c., were made on each side. Both were in the upper quadrants, one just in front of the coronal plane and directed well up, and the other at a lower level and more forward. The patient was able to speak, though somewhat slurred, in 30 minutes. The plantars were then flexor.

An hour later he was sitting up eating his dinner with pleasure. Four hours later he was up to go to the lavatory on his own initiative. He said he felt "Very well thank you." He had no recall of the morning without prompting, and then could only remember talking to me. He firmly denied that he had catarrh in his nose. He was not interested in talking about ghosts or Roman Catholics. He remained quiet and orderly in conduct, with vague but polite answers to questions.

During the next day he was quiet and orderly, following his usual daily routine. During the afternoon he recapitulated a phase of his post-operative course with the mouthing of saliva and the preparations to spit. He did not spit. He was able to eat in company, whereas before the others were "such objectionable people" that he could not dine with them. On 22 October there was return of the more overt post-operative symptoms, with references to his genitalia and masturbation in his conversation. This occurred after wetting the bed, but did not last. He remained quiet, eating well, able to carry out allotted tasks, but without initiative. He remained well conducted but increasingly withdrawn until 31 October. He then broke two windows "because he didn't like them."

The infiltration was repeated on 31 October, under 1.0 gm. thiopentone. Three injections, each of 2 per cent. procaine (2 c.c.), were made into the upper quadrants only on each side, radiating from the burr-holes and in front of the original incision. Ninety minutes later he was sitting up in bed, happy and confused, rather restless and talking a good deal of nonsense. He stuttered over some consonants, and was unable to pronounce the "th" as in "father." In the next 90 minutes he became more and more excitable and happy. He was throwing things around his room, laughing uproariously, talking and shouting to himself and others. His attention was readily diverted, and he was easily managed. He was put to bed with a sedative, but roused and sat up if anyone passed the door. He would then talk spontaneously for minutes, if he was answered or not.

Three hours later his speech was no longer continuous, some of his meaning intelligible, and he would occasionally answer a question after a pause in his talk. This was mostly about his previous ideas, Roman Catholics, his girl friend, his masturbation, etc. He was nevertheless very happy about most things.

"This is funny, Ha! Ha! What's that . . . (unintelligible), Doctor? Ha! Ha! Don't worry about me, Doctor, Ha! Ha! Blast you! Blast you!" (This last abuse may have referred to the writer, but probably was intended for his penis, which he then exhibited.)

"Hick! Hick! and Dick! Dick! Ha! Ha,! Ha! Ha!" (Smiles, and pulls the bed-clothes about. His tea is brought in at this point.)

"Hick! Hick!, cup o' tea, Hick! Hick! Hiccough! By Gosh, not much tea, Ha! Ha,! pie, Ha! Ha! By Gosh, Dick, you're being stupid, that's what you're being! Hick! Hick!" (Starts on his tea.)

Q. "Enjoying your tea, Dick?"

A. "Yes, very good, thank you; there is something there, look at it. Doctor, it's not mine, Ha! Ha! It's not mine" (spells out the linen mark on the sheet). "Ha! Ha! Look at it" (goes on eating).

Q. "Would you like another pie?"

A. "Yes, that would be very good, yes, two pies, Doctor, Ha! Ha,! yes, that would be very good . . ." and so on.

He slept during the night with sedatives. He was noisy and cheerful by 8.30 next morning. He got himself up but was returned to bed. In the afternoon he was much quieter, but still happy, using a lot of gesture, and with a lot of laughter interspersed in his remarks. Conversation was repetitive.

Q. "What year is it?"

A. "What year is it?" (Pause.) "1949."

Q. "And what month is it?"

A. "And the months?, Oh! goodness me, months? Ha! Ha!" (Spits.)

Q. "Is something the matter?"

A. "There." (Rubs his teeth.) "Dashed if I know what it is called. There." (Points.) Ha! Ha!" and so on.

By the following day, 2 November, he was quite settled. There were no restless movements of hands or features, and he was amenable and co-operative in a sustained fashion.

Q. "Why were you told to go to bed? Was it because you broke a window?"

A. "Yes, I broke *two* windows; I'm very sorry about it."

Q. "Do you remember why?"

A. "Yes, I remember why."

Q. "Why?"

A. "They didn't look very nice."

He would not enlarge on this point.

Q. "What are you going to do?"

A. "I am going to be very good in the future."

On 3 November, 1949, he was up all day, talking freely and pleasantly. He, of his own initiative, wrote a four-page letter to his girl friend. This consisted of a brief résumé of his family, his life, his present whereabouts and previous daily routine. In this letter, and in another written the next day to his family, he attributed his insanity to masturbation. On these two days, and the next, he was distinctly better than for a long while. Very co-operative, and occupying his time; he was showing some understanding of his condition, and would accept it as such.

Unfortunately this did not last, and he relapsed over the next 36 hours. On 7 November, under 1.0 gm. of thiopentone, 2 infiltrations were made in the lower quadrants. Into each 1 c.c. of 4 per cent. procaine was injected. He was awake in 30 minutes from the start, and able to speak slurredly. Ninety minutes later he was lying quietly in bed. He said he was well, and could remember writing a letter two days before (three, in actual fact). He said he was quite upset about having mentioned roses in the letter (flowers were mentioned, but not specifically roses), for he realized that they were not in season now. The date he gave as 6 November, which was in agreement with the previous remarks. During the rest of the day he was quiet, sleeping at times, eating a good tea, and remarkable for the absence of gesture and facial expression. Questions were answered slowly with pauses, and often in the third person.

Q. "How long have you been here?"

A. "I have been here one year."

Q. "Why?"

A. "There is something wrong."

Q. "With catarrh?"

A. "Because my head is not right"

Q. "In what way?"

Q. Repeated.

A. "Dick's head is insane."

The next day he was still rather disinterested and inactive. He was more talkative in the afternoon, and his manner was more natural. The following day he said he was not too well, but it was too important and too personal to mention or discuss. In the later part of the same day he was again quite friendly and co-operative. He reached the maximum improvement the next day, 10 November. There was some superficial insight, and he was well conducted.

In the next three days he relapsed, first by blaming the staff for making him insane, and then by retiring into solitude, refusing to be in the same room as others. He then began to find his fellow patients "objectionable," and finally struck one, after another three days. This occurred again the next day. By this time he was for long periods, during the day, in a catatonic stupor, sitting in one position for hours, but with frequent small movements of the hands and an increase in the degree of "stare." In the next two or three days episodes of excitement became more frequent. Nevertheless, on 21 November he wrote home. This letter concluded thus:

"I have written in my other letter that I am insane, I can tell you all more about this. The left front of my brain has gone and I still have the right side.

"Goodbye all, etc."

By 25 of November he had relapsed back into a state where he was worried by spirits, by sexual matters, and by loss of the left half of his brain. This latter appeared to have replaced the "catarrh." On this particular day he was a Protestant, but influenced by various spirits. There was considerable blocking, or as he put it, "I want to say something but only get the first letter, and then something else comes." (There was still some stuttering over some initial consonants.) Most of his excited, erratic conduct appeared to be motivated by sundry spirits and the Holy Ghost.

Eighteen days had elapsed since the previous injection, and all improvement had evaporated.

On the 26 November the infiltration was repeated. This time only one injection (2 c.c. of 4 per cent. procaine) was made on each side, and the needle directed through the burr-hole to the opposite pupil. 0.7 gm. thiopentone was used. The course after this procedure was somewhat like that following the second injection (31 October). During the rest of the day he was cheerful, with laughter interspersed in his remarks. Conduct, however, was reasonable, he kept his bed-clothes tidy, and was politely co-operative. On this occasion he wet the bed twice. The next day he was improved, with less exuberance of spirits, but with more return of his previous ideas. He was clean and tidy, and prepared to discuss his ideas in a friendly manner.

Several comments he made were:

"I'm in good health now." "The left side of my conscious brain is not with me but all on the right side is in good health." "Some Spirit has been troubling me." "Either God or the Devil." "I have been going about and the Spirit told me to keep in time." "As far as the Spirits are concerned I have prayed a lot." And so on.

His troubles slowly re-asserted themselves, and on 2 December he was again refusing to associate, because people were "objectionable." E.C.T. on 4 and 8 December controlled this return of symptoms. Subsequent to a visit from his parents on the 15th December he was again aggressive towards other patients. Further E.C.T. ultimately controlled his behaviour at a reasonable level, and was given symptomatically for this purpose, thereafter, during the period of observation (6 weeks).

SUMMARY.

In the first section of this paper some animal experiments are described. These were carried out in 1947 without knowledge of the work of Soulairac and Barbizet on rats (1946). Subsequently 8 infiltrations of the white matter

of the frontal lobes have been carried out with local anaesthetic agents (in 3 psychotic patients). On some occasions there was immediate improvement, and in others improvement only after a period of altered conduct. The duration of the benefit over several days is noteworthy. The first case showed immediate benefit, but the repeated infiltration led to confusion.

The second case showed some benefit, which was sustained for weeks, apart from one of his short excited episodes.

In the third case 4 injections were more effective in controlling behaviour over a 6-week period than 12 E.C.T. in the preceding 6 weeks, and an equal number of E.C.T. in the subsequent six-week period.

ACKNOWLEDGMENT.

The writer wishes to thank Prof. W. V. Macfarlane for his active help with the first part of the work, and his interest and encouragement in the second part.

LITERATURE

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PRELIMINARY REPORT ON TRANSORBITAL LEUCOTOMY.*

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ONE's approach to transorbital leucotomy must be critical for many reasons, chiefly that it is another blind operation with all the deficiencies this signifies. Meyer and McLardy have demonstrated the variety of anatomical sites in which lesions may be found following prefrontal leucotomy, and have stressed the variability in the position of the underlying cortex in its relations to the bony landmarks of the skull. Once more, sweeps are to be made with a blunt instrument, and the differing consistency of the brain, and perhaps its movement, will make it impossible to be certain whether the lesion produced is the size intended and in the position calculated. The dangers of intracerebral haemorrhage exist as before, and, in addition, because of the site of entry, there are chances of introducing infection, of cerebral rhinorrhea resulting from damage to the frontal sinuses, and of raising bone spicules from the orbital plate. More recently McLardy has said that with the addition of the deep frontal cut, were the caudate nuclei to be damaged bilaterally, restlessness, persisting incontinence and "delayed operative death" might occur, as may follow posterior cuts in prefrontal leucotomy.

Nevertheless, Freeman has emphasized the relative safety of this operation, and its simplicity, which allows its performance by any doctor who cares to learn the procedure. In his paper, published in the *Lancet* in September, 1948, he said that he had found the operation of value in obsessional and anxiety states, in hypochondriasis, and in cases needing maintenance shock therapy. Schizophrenic psychosis of long duration was generally a contraindication, but disturbed behaviour might be brought at least partly under control. Personality changes he had found to be slight.

At that time, there were on the male side of this hospital a large number of patients awaiting prefrontal leucotomy. The need for alterations in the operating theatre and of obtaining certain apparatus for a neurosurgeon, meant that these could not be operated on for 12 to 18 months. It seemed that in this situation a full investigation should be made of exactly to what extent this operation would be of value in mental hospital work. Only partial relief of symptoms might be obtained, but minimal blunting would leave the patients receptive to other approaches.

The *aims*, therefore, in the first place were, in a group of chronic psychotics who would normally be chosen for standard leucotomy because of symptoms such as depression, agitation, aggressive and destructive behaviour, to find (1) whether a moderate degree of change might be obtained, with some relief of distress, an improved occupational level, less nursing supervision, and perhaps

* A paper read at a meeting of the South-Eastern Division of the Royal Medico-Psychological Association, held at Napsbury Hospital on 25 April, 1950.

a better ward ; and (2) whether results were an indication as to which cases would respond to further leucotomy if this was considered ; would, for example, no improvement with transorbital mean that it was not worth while proceeding to full prefrontal leucotomy ? A further aim was to become familiar with the technique and gain experience before treating better preserved and earlier cases, whom it might be hoped to render symptom-free.

Two psychiatrists (Dr. A. Probert and the author) selected cases with operations and clinical assessment done by one (A. M. E.), and anaesthetics given by the other (A. P.), and 52 cases were treated between February and August last year. The assessments of their present status were made in February and March of this year, and at that time 34 cases were 6-9 months after operation, and 18, 9-12 months.

In the July number of the *Digest of Neurology and Psychiatry*, 1949, the additional deep frontal sweep was described by Freeman, and he gave further details to the Royal Society of Medicine in September. He claimed that the operation was now as extensive anatomically, and as effective clinically, as a standard prefrontal leucotomy.

A second group of cases, 19 in number, have been treated with this modification between October, and February this year. Assessments presented were those of March to April, when 16 cases were 3-6 months after operation, and 3 cases 2 months. In deciding status the observations of ward doctors, of one or more of the nursing staff, and of occupational therapists have been used, in addition to clinical interview and examination. Cases discharged have attended hospital, and the psychiatric social worker, Miss Thomas, has visited homes to interview relatives. Symptom tables have been drawn up and scored for presence, absence, or degree of intensity on a three-point scale. The method has its limitations, but has been found of value. Only a few cases in each group have been suitable for psychological testing.

Criteria of improvement were those used in the Connecticut Co-operative Clinical study of prefrontal leucotomy, since these seemed particularly appropriate to mental hospital cases, and will afford an extra source for comparison of results, with that operation. Improvements noted are relative to the condition of the patient in the month before operation.

1. *Recovered or symptom-free*.—Patients free from subjective symptoms and showing social recovery—living at home under normal conditions and returning to their former level of useful employment. Deviations from normal premorbid personality and adjustment, though not described by the family, might still be apparent to the psychiatrist.

2. *Markedly improved*.—Subjective and objective symptoms had almost but not entirely disappeared. Patients manifested good environmental adjustment at home or in hospital, and were capable of work, though not necessarily up to former standards.

3. *Moderately improved*.—Appreciable diminution of symptoms, constituted little or no problem in care and exhibited definite improvement in either environmental adjustment or work adjustment, or both. Improvement in environment might be in the hospital, or from hospital to home.

In this category were patients who previously had been serious nursing problems, and were now able to do consistent occupational therapy or simple work in the hospital.

4. *Slightly improved*.—Indicated no change in environmental or work adjustment and only slight improvement in symptoms. The problems of management were reduced somewhat, but the patients still required careful supervision. Troublesome

features such as violent and destructive tendencies, or food refusal may have been lost.

5. *Unimproved*.—No change.

6. *Worse*.—Exacerbation of previous intractable behaviour or increase in subjective symptoms.

The term Significant Improvement will be used to group together Recovered, Markedly and Moderately Improved. It does not imply a statistical significance.

It would seem most probable that cases showing slight improvement will relapse in time, and grouping is therefore with Unimproved.

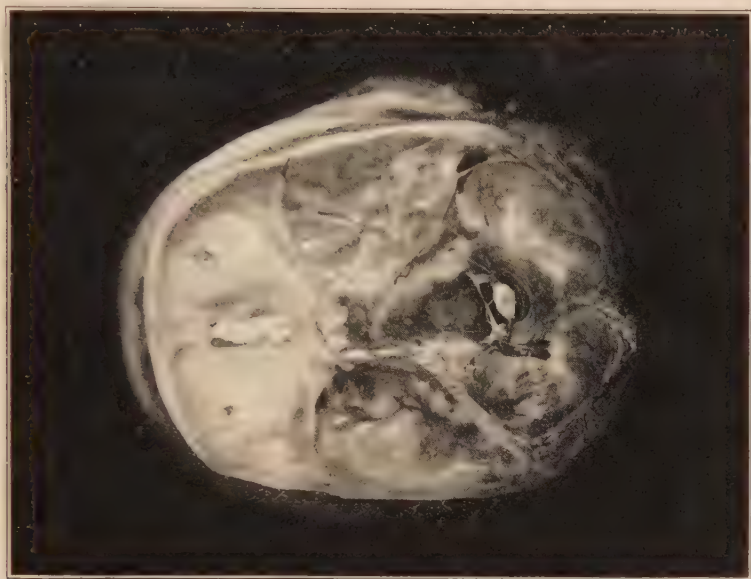


FIG. 1.—Base of brain showing sites of entry.

TECHNIQUE.

Penicillin drops (1200 units per c.c.) are put in the eyes two or three times the day previously, and again on the morning of the operation. Any case with inflammation of the conjunctiva is rejected.

Pre-operative atropine 1/100 grain is given, and as a sedative intramuscular paraldehyde or rectal avertin. Face and forehead are swabbed with dilute Dettol solution. Intravenous pentothal is used for anaesthesia in preference to E.C.T. Sterile gloves, masks and gown are worn, and sterile towels clipped round the scalp and placed over the nose and mouth. A nurse holds the head firmly. Although there has been no case with injury to the frontal sinuses, it was decided after the first few months to take routine antero-posterior X-ray of these sinuses, which are followed by lateral views if these should be unusually large.

Transorbital leucotomes made by Down Bros. and H. A. Ator have been used. The latter have been preferred because of their lightness, small handles and sharper points.

The operative details in both operations are exactly as described by Freeman.

Original method.—The eyelid is raised and the leucotome introduced centrally above the eye into the superior conjunctival sac and directed against the orbital plate at the point of greatest convexity. This is approximately 3 cm. from the middle of the skull and 2 cm. behind the superior orbital ridge. The shaft is in the plane of the nasal bone.

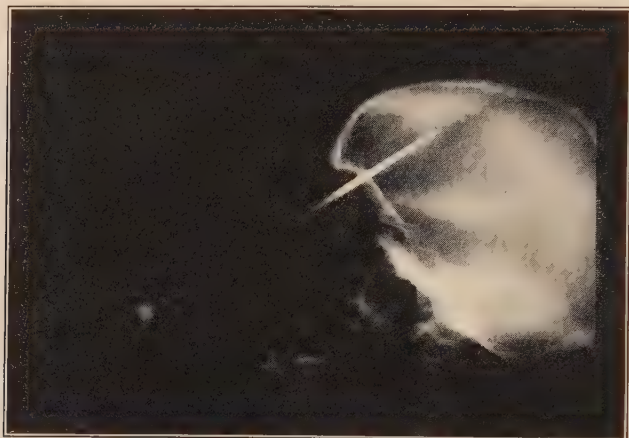


FIG. 2.—X-ray with leucotome driven in to furthest point.

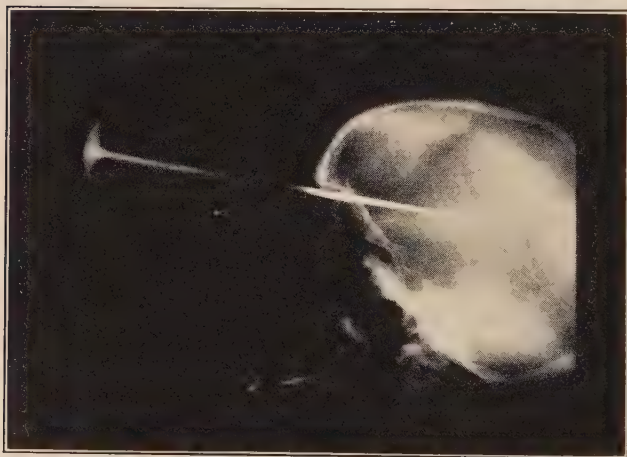


FIG. 3.—X-ray after deep frontal cut.

It is driven in to a depth of $\frac{7}{4}$ cm., as noted by the upper eyelid, with gentle taps of a wooden mallet, and the handle is then drawn laterally until it reaches the lateral margin of the orbit. It is returned to the middle position and driven in further to 7 cm., always in the plane of the bony ridge of the nose.

The handle is then moved gently 15 to 20 degrees medially and then to the same angle laterally—returned to the mid-line and withdrawn rapidly.

There is great variation in the thickness of the orbital plate. Some are

so thin that the slightest pressure drives the point of the instrument through, whilst others are extremely hard. In one case, though not in this series, it was impossible to angle the instrument on one side.

The Deep Frontal Sweep.—The introduction of the instrument is at the same site and in the same plane as before, but the first wide lateral sweep to the margin of the bony orbit is made at 5 cm. instead of 4. The leucotome is then returned to an oblique position with a slight medial inclination and driven in to 7 cm. It is then moved 20 medially and 30 laterally, and the handle in the latter position is raised in this oblique plane until it meets the superior orbital ridge. The handle is returned to the parasagittal plane, lowered a fraction, and then withdrawn rapidly.

The full sweep in this deep frontal sweep is sometimes hindered by the toughness of the orbital plate.

A pad is held firmly over the upper eyelid after the withdrawal of the leucotome, and then bandaged over the closed eyes. The pads are removed when the patients regain consciousness. They are allowed to sit up in bed gradually, if they wish, 6 to 8 hours after operation, and are out of bed the following day—going to occupational therapy on the second or third day.

Pulse, temperature, blood pressure and respiration rate are observed regularly during the first 24 to 36 hours, as following prefrontal leucotomy.

RESULTS WITH ORIGINAL TRANSORBITAL LEUCOTOMY. (52 Cases).

	Number of cases.	Significant improvement.
<i>Schizophrenia.</i>		
Paranoid	18	5
Paraphrenia	8	1
Catatonic	7	2
Hebephrenic	6	0
Mixed reactions	3	0

Affective Disorder.

Depressive psychosis	1	1
Severe chronic anxiety neurosis	1	1
Chronic mania	1	1
Hypochondriasis	3	1
Obsessional disorder	2	0
Epilepsy	2	0

Combined Results :

Significant improvement	11
Slight improvement or unimproved	39
Worse	1
Death	1
(Discharged home)	8

The temperature is usually about 99° in the evening of the operation day. Originally, Sulphatriad, 3 gm. and later 4 gm., was given daily for the first two days prophylactically, but more recently this has been replaced by 600,000 units of oily penicillin, given at the same time as pre-operative atropine, with 300,000 units the following day. If temperature rises above 99°, sulpha drugs and penicillin are used together in increased doses, but this has been necessary only on 3 occasions.

Headaches are not frequent, and then only slight and of short duration.

Bruising round the eyes and swelling of the lids is usual, but the latter subsides within 2 to 3 days, and bruising fades and disappears within 1 to 2 weeks.

Paranoid Schizophrenia.—18 Cases.

Significant improvement 5 (1 discharged ; 1 other possible discharge shortly).

Duration of Present Illness.

Status.

Under 2 years . . . 1	Moderate improvement . 5
2-5 years . . . 7	Slight improvement . 5
5-10 years . . . 3	Unimproved . . . 7
Over 10 years . . . 7	Died 1

The patient discharged, a man of 32, had been ill for 13 years, during which time he had been in hospital on many occasions and had had full insulin coma therapy and E.C.T. with only slight response. There appeared to be a periodicity in the severity of his symptoms. Whilst in here he was extremely agitated and apprehensive, with persecutory delusions and hallucinations, and continual impulsive violence. E.C.T. had brief effect. He made progress following leucotomy in August and left hospital in November. He lives a solitary existence at home, and is afraid to mix socially with people apart from his family, as he fears he might attack them. He goes for walks, and visits the library and cinema, and more recently rides his motor bicycle again. He shows affection for his mother and father, talks more readily than before, is even-tempered and equally particular about his appearance. He has lost his fears of the dark.

Improved patients remaining in hospital show a more friendly manner and are less suspicious, though delusions and hallucinations and some irritability remain. Depression, food refusal and self-injury are nearly always relieved, and noisiness greatly diminished.

Aggressive behaviour is at present absent in half the cases who had shown it previously. Experience with some of the early cases shows that these may relapse after 9 to 12 months.

Severe destructiveness may be diminished, but does not go entirely.

Two cases who had not worked for years have been usefully occupied since, one, in addition, playing the saxophone in the hospital band.

A brief exacerbation of impulsive violence 5 weeks after operation was seen in a patient who had not displayed this for 7 years. The operation was done at a time when he had begun to deteriorate.

Paraphrenia.—8 Cases.

Significant improvement, 1 case (1 discharged).

*Duration of Present Illness.**Status.*

Under 2 years	. . . 1	. . .	Markedly improved	. . . 1
2-5 years	. . . 5	. . .	Moderate improvement	. . . 0
5-10 years	. . . 2	. . .	Slight improvement	. . . 4
			Unimproved	. . . 2
			Worse	. . . 1

The case discharged was a man of 47 with mild diabetes, whose psychosis had been developing for 7 years. Following leucotomy in April, he was cheerful, and occupied from the first.

Aural hallucinations subsided 6 weeks afterwards, and when he left hospital 5 weeks later, delusional ideas were still there, but he referred to them much less. He has obtained a position as a commercial traveller, and is doing well. His wife reports no change in him except that he gets tired more easily. He is sociable, has taken up his former interests, reads heavy literature, and has unimpaired concentration. Mood is cheerful and shows little variation. He is still sensitive to other people's distress.

In the others there is reduced tension and suspicion, and relief of noisiness and abusiveness. Hallucinations and delusions remain. Obsessional thoughts in one, and hypochondriacal in another, are less distressing. In one case with depression and obsessional symptoms, delusions and hallucinations are more florid.

One patient showed improved response to E.C.T. after operation, and another has had great relief of an intractable pruritus ani.

Catatonic Schizophrenia.—7 Cases.

Significant improvement, 2 (1 discharged).

*Duration of Present Illness.**Status.*

Under 2 years	. . . 1	. . .	Moderate improvement	. . . 2
2-5 years	. . . 3	. . .	Slight improvement	. . . 1
5-10 years	. . . 2	. . .	Unimproved	. . . 4
Over 10 years	. . . 1			

An impulsively violent, suicidal and destructive man aged 34, who had been ill for 7 years, and for 4 years was nursed on and off in a padded room for long periods with heavy sedation, has worked consistently since operation one year ago. In the last 2 months he began to show phases when he was tense, and aggressive in manner to other patients, and has had transorbital repeated with the deep frontal cut within the last week to prevent full relapse.

A man aged 27, with a psychosis of 3½ years' duration, who had had 2 courses of insulin coma, and much E.C.T., but continually relapsed into stupor, with occasional violence, was only slightly improved, until about the fifth month when he brightened, and was able to be discharged home a month later, though still showing retardation.

*Hebephrenia.—6 Cases.*Significant improvement—*nil*.

<i>Duration of Present Illness.</i>	<i>Status.</i>
2-5 years . . . 1 .	Slight improvement . 3
5-10 years . . . 3 .	Unimproved . . . 3
Over 10 years . . . 2	

Impulsiveness, overactivity, resistiveness, destructiveness and interfering behaviour are the symptoms that have been influenced. One, unemployed for 5 years, though incoherent and hallucinated, did heavy manual work for 11 months, with a greatly diminished destructiveness and then relapsed completely. Transorbital has been repeated recently with the deep frontal cut.

Of 3 cases of schizophrenia not falling into the previous groups, showing mixed reactions with marked depressive features, 2 are slightly improved and the other unchanged. All were between 2 and 5 years' duration.

Suicidal thoughts and self-reproach disappeared, but schizophrenic symptoms were unaltered.

One patient, though not depressed, refusing food, or attempting to injure himself now for 2 months, occasionally handled his faeces openly and put them in his mouth 5 months after operation. This behaviour was associated with delusions he had had previously of being changed into an animal. A shy, sensitive young man of 27 still had ideas of reference, is less depressed, lives at home, and is now able to go about by himself.

*Percentage of Male Cases of Schizophrenia Discharged,
Recovered or Improved.*

	Board of Control figures for 1000 cases of prefrontal leucotomy. (%).	Original transorbital leucotomy (41 cases). (%).
Under 1 year .	62.5	(Only 1 case)
2-4 years .	26.9	10.5
5-9 years .	15.5	10
10-19 years .	17.1	10

These figures are presented quite tentatively, are based on small numbers, and would, of course, need a more detailed analysis before presenting a true comparison of the results of the two operations. For example, none of the transorbital cases have recovered and there are no control group figures.

Affective Disorder.—3 Cases.

(2 recoveries ; 1 unimproved).

CASE 1.—A depressive psychosis in a married man of 41, a clerical worker with a mildly obsessional personality, who began to develop tension and depression when he was called to the Navy in 1943. He managed to keep going for a year, with sedatives and reassurance, but was then admitted to hospital and received

E.C.T., and was later invalided. He continued to feel depressed and anxious, slept poorly and occasionally had suicidal ideas, but worked until admission in March, 1948. With E.C.T. he became superficially improved, but depressive ideas and tension remained. He left against advice, but was shortly readmitted with intense depression, agitation, suicidal ideas and delusions of guilt, with self-accusation. Leucotomy was performed in April last year. He claimed relief from the first, but his ideas were of a depressive nature for another 6 weeks. He left hospital 2 months afterwards, cheerful, but showing some tension. Because of his history he had difficulty in getting clerical work, as he would only try for pensionable jobs. He found a position as a gardener eventually, in a park, his father's occupation. His wife says she sees no change in his personality. He is affectionate, responsible, and resourceful, and not as obsessively tidy as before. Clinically he appears recovered. Psychological testing has been done, but results are inconclusive.

CASE 2.—A severe chronic anxiety neurosis of 9 years' duration in a man of 33, with paranoid traits in his personality. Symptoms developed following capture by the enemy in 1940, and escape, and a period in a Spanish concentration camp, but he did not report sick until 1944. He was discharged after treatment in a neurosis centre, and was later admitted to Sutton Emergency Hospital and Shenley. He had modified insulin, continuous narcosis, abreaction with ether, and daily psychotherapy. Tension, irritability, poor sleep, paranoid feelings and fits of depression with suicidal ideas continued. He was advised to have leucotomy, but refused. Symptoms continued and were accompanied by rages, and constant demands for intercourse with his wife.

In 1949 he was charged with handling his daughter's genitals, and mental hospital treatment advised. He made no response to modified insulin and sedation.

Transorbital leucotomy was done in July, 1949.

He was immediately relaxed afterwards, ate and slept well, could concentrate to read, managed without sedatives, and was discharged in October, still symptom-free. He found work in a few weeks as a van driver, and has continued at this since. He is on much better terms with his wife, is considerate at home and generous. He plans for the children, and is looking for a better job. He is able to read and concentrate, and says, "I'm not always looking for trouble. I haven't got that spitefulness. If I get upset it's only for five minutes, where before I used to brood for days." There have been no dreams since operation.

On one occasion when he was alone with his daughter, 2 weeks after leaving hospital, he made a tentative approach to her, but there has been no further incident like this.

Recently, psychological tests by Mr. Price (8 months after operation) seem to indicate a slight degree of intellectual deterioration. Clinically he appears recovered.

CASE 3.—Chronic mania, in a man of 48, which had not responded to E.C.T., remains virtually unchanged. He is slightly less impulsive and interfering than previously.

Hypochondriasis.—3 Cases.

1 moderate improvement ; 2 unimproved.

CASE 1.—A man of 31, who had had hypochondriacal symptoms for 10 years. He had frequent periods away from work, complained of a variety of pains all over his body, with dizziness, headaches, insomnia, irritability, fears of infection, and insanity, and obsessional brooding. He was admitted twice as a voluntary patient. Leucotomy was in August, 1949. Phobias and tension were relieved, and ability to concentrate improved. He remained very hypochondriacal until about the fifth month afterwards when complaints began to decrease noticeably. He has left hospital recently and hopes to start work again shortly. The degree of improvement is moderate.

His wife noticed that in these early months he was more irritable, more argumentative and ready to use bad language. He is still indecisive and mildly obsessional. The setting of the syndrome was one of constitutional inferiority and chronic anxiety.

CASE 2.—A single man of 40, who had never kept a job for long and was discharged from the Army after 5 weeks, with "nervous and gastric trouble," in 1942. He worked spasmodically for a short time but continued to complain of numerous symptoms, and was always going to hospitals asking for investigations. He had 3 admissions to this hospital, for varying periods, when he was continually demanding X-rays, restless and agitated, saying he was driven mad by his pains. He had several courses of E.C.T. with only temporary effect. He stopped everybody he met, pleading his case, demanding sedatives constantly, and beat on his sideroom door at night calling for medical help.

Leucotomy was in February, 1949. For 6 months he was less insistent, slept well and put on weight, but then gradually relapsed to his former state. The reaction was of psychotic degree, the aggressive nature of the hypochondriasis allying it prognostically with the paranoid psychoses.

CASE 3.—A single man of 57 who, for 6 years, had been miserable and full of complaints of pain and tension in head, neck and limbs. He had been 2 years in hospital, showing extreme hypochondriasis, agitation, loud coughing, and continual movements of his mouth. E.C.T. had, unfortunately, resulted in an impacted fracture of the neck of the femur on the second occasion. This had been pinned. The operation was in August, and there has been no improvement. The setting is that of a chronic depressive psychosis with hysterical features.

Obsessional Disorder.—2 Cases.

Both cases remained unimproved.

CASE 1.—A single man of 33, with a schizoid personality, suffering from a severe chronic obsessional disorder. He had his first breakdown at 12, and then again at 19 with obsessional thoughts of guilt and indecision, and these had continued, with fluctuating depression, suicidal thoughts, headaches, and great tension. He had only temporary relief with concentrated E.C.T. and maintenance E.C.T.

Relief after operation was only for 2 days.

Symptoms were exacerbated in the first 2 months, and he was unimproved.

CASE 2.—An obsessional disorder of 12 years with post-encephalitic Parkinsonism. An anxious agitated man, demanding treatment because of distressing thoughts of murder and suicide. Unimproved.

Epilepsy.

Two violent unemployed patients, who had been in hospital between 5 and 10 years, were able to attend occupational therapy for a few months and then relapsed.

Complications.

1. One death from an intracerebral haematoma in the left frontal lobe. The patient died 7 days after operation. The brain was sent to the Maudsley Hospital who have given us the accompanying photographs, Figs. 4 and 5. The first shows the haemorrhage on the left side, the second is a section through the other frontal lobe at the site of the medio-lateral sweep.

2. One major seizure in a patient 8 months after operation.

3. A patient collapsed in the lavatory 7 days after operation and was found unconscious, but recovered within a few minutes. It is possible that he had a fit, but there is no definite evidence of this. He later had giddy feelings on rising in the morning 5 weeks afterwards, which cleared after 2 weeks.

4. Another patient was febrile for 4 days after operation and appeared apathetic during this time. No definite cause was found for this. Recovery was uneventful. There has been no alteration in his psychosis.

5. No cases were incontinent.

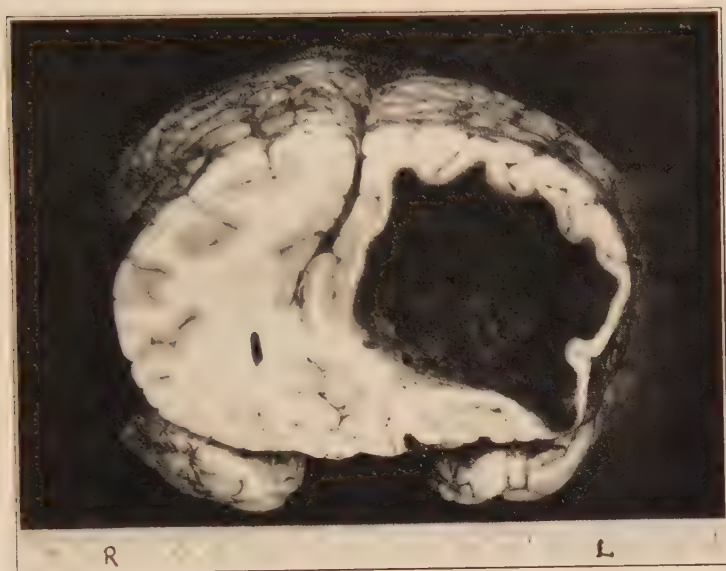


FIG. 4.—Intracerebral haematoma in the left frontal lobe.

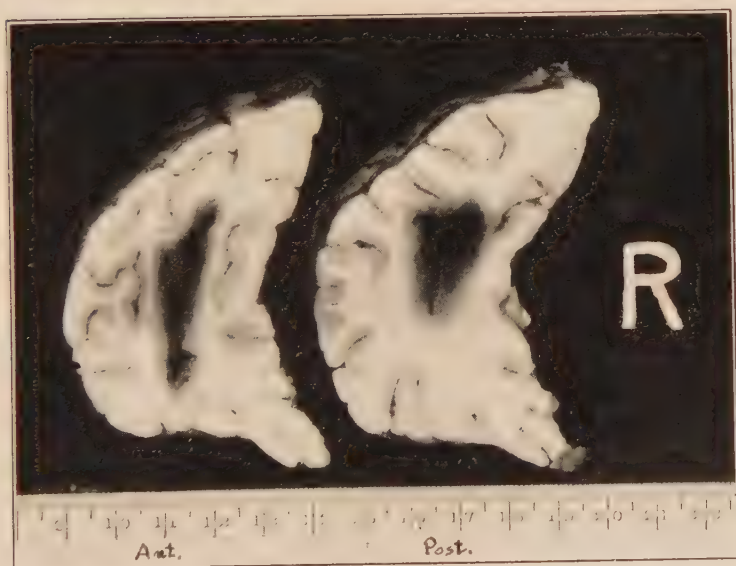


FIG. 5.—Section through the other frontal lobe, at the site of the medio-lateral sweep.

Personality Changes.

As the majority of this group were chronic psychotics, and discharges a mere handful, the opportunities of assessing personality changes fully have been few. Nevertheless, it emerges fairly consistently that these are slight. The patients are alert, talk readily, though not perhaps at previous length, and show initiative. They have found positions for themselves on discharge in spite of difficulties. Affective response is good, and concentration unimpaired.

Dreams are diminished in number and more difficult to recall.

Irritability was more noticeable in one case.

No patient has developed inertia, apathy, callous or explosive behaviour.

Psychological testing seems to reveal no deterioration or slight degrees, which may still be detected 8 to 12 months afterwards.

Conclusions.

1. Original transorbital leucotomy is of most value in the treatment of agitated depression and severe chronic anxiety neuroses which have failed to respond to other methods.

2. Hypochondriacal syndromes may be relieved if in a setting of chronic anxiety.

3. In schizophrenic psychoses of over two years' duration results are disappointing. No case has been rendered symptom-free. Improvements can be obtained in half the cases, but two-thirds of these are slight, and the other third only of moderate degree. Relapses are frequent after short periods of encouraging improvement. Response was best in paranoid and catatonic groups.

Depressive symptoms can be relieved, but occasionally delusional ideas become more prominent.

Exacerbations of the psychosis occur in a minority for short periods during the first to third months.

4. Severe obsessional disorders and epileptic psychoses are uninfluenced.

5. Personality and intellectual defects are slight.

6. Response to E.C.T. may be improved after operation.

RESULTS WITH TRANSORBITAL LEUCOTOMY WITH DEEP FRONTAL CUT.

(October, 1949, to February, 1950.)

19 cases. Significant improvement, 6 (5 discharged,).

	Number of cases.	Number showing significant improvement.
Schizophrenia :		
Paranoid . . .	9	3
Paraphrenia . . .	1	0
Catatonic . . .	3	0
Obsessional disorder . . .	3	1
Hypochondriasis . . .	2	2
Epilepsy	1	0

Schizophrenia.

13 cases. Significant improvement, 3 (1 discharged).

<i>Duration of Present Illness.</i>	Paranoid,			Paraphrenia,			Catatonic,		
	9.			1.			3.		
Under 2 years . . .	1	.	0	.	0	.	0	.	0
2-5 years . . .	0	.	1	.	1	.	1	.	1
5-10 years . . .	5	.	0	.	0	.	2	.	2
Over 10 years . . .	3	.	0	.	0	.	0	.	0
Moderate improvement . . .	3	.	0	.	0	.	0	.	0
Slight improvement . . .	4	.	1	.	1	.	1	.	1
Unimproved . . .	2	.	0	.	0	.	2	.	2

These cases were the tail end of the original selected group and were those that one felt less chance of influencing. Eight of the nine paranoids were over 5 years in duration. The type of symptoms in which alteration has occurred were much as before. Tension, anxiety, depression, noisiness, and food refusal have responded well. Five of the seven patients who were violent have shown no aggression as yet, and proportions are approximately the same for impulsiveness. Two have had exacerbations of their psychotic behaviour for short periods. One man, with a psychosis of 27 years' duration in association with confusion and apathy, was incontinent of urine and faeces for one month, starting 3 weeks after operation, with one isolated occurrence 2 weeks later. Confusion cleared and he is now leading a solitary routine existence at home, going for walks and helping in the house when prompted. He shows diminished tension, and has gained weight.

A very suspicious, agitated patient with florid delusions and hallucinations, who had the original operation in July last year and showed a moderate degree of improvement for 4 months, then relapsed, was operated on again in February, and again shows a more relaxed friendly attitude, though delusions and hallucinations are as previously. The impression gained so far is that this operation is more effective than the original.

Hypochondriasis.

Both the cases in this group presented severe and prolonged hypochondriacal syndromes in a depressive setting, and have left hospital improved, one symptom-free.

CASE 1.—A married man of 51, who had had hypochondriacal symptoms for 24 years with fluctuating depression and occasionally suicidal ideas. A course of E.C.T. in 1945 had lifted the depression, but left his somatic complaints as before. He had been unable to work for a year, and had been in hospital previously as a voluntary patient during this time. He could speak of little but his headache, backache, insatiable thirst, dizziness and fainting sensations, and the feelings that his stomach was "always on the churn," with gas moving about his abdomen. Since leucotomy, 5 months ago, he has been greatly improved, left hospital after 2 months and is now symptom-free. He is cheerful and energetic, and says he

can eat a normal diet. His wife says the degree of his affection for her seems unaltered, but he is irritable and abrupt on occasions. He is not as talkative as previously. Continues to read regularly as before. He has arranged their removal to a district where there is more opportunity for work. He says that he was "a little more sentimental" before, and "I can't get as close in feeling to my child."

He has no dreams. He has never had much interest in the opposite sex, and his almost complete impotence and lack of desire is unaltered.

The Rorschach has been done by Mr. Wheeler before, and at 1 and 4 months after operation. Hypochondriacal tendencies were absent in both post-operative records. At 1 month speed and spontaneity were reduced and output decreased. Phantasy content suggested a less childish, but more rigid personality. Susceptibility to environmental influence had been low in the pre-operative test, but was now even less. At 4 months reaction time was more rapid than on both previous occasions. There were still signs of immaturity, but more balance, less tension, and greatly increased social adaptation. There were some indications of stubbornness.

CASE 2.—A married women of 41 with a severe obsessional neurosis which had started 8 years previously after birth of her child, with obsessional impulses to attack and strangle the child and other people. She had not been able to be left alone, and for 3 years she had had to be with her husband continuously, traveling with him in his work and acting as secretary. She had feelings of depression tightness in her head, and had treatment with E.C.T. in 1947-48, and then one year's analysis, which included narco-analysis and sessions with ether abreaction, with no improvement.

Operation in January this year.

During the fortnight she was in hospital and afterwards she was at ease, and greatly improved. After her return home she continued to feel better and not disturbed by her obsessional ideas which only occurred occasionally. She had not the confidence to go about by herself and within 3 weeks had relapsed to her former condition, and complained for about a month that she had less energy than previously. Rorschach, done by Miss Alcock one month after operation, showed definite traces of organic impairment of a frontal lobe type. These included excessively long reaction times and total time relative to the number of responses. The latter were few, with some perseveration, use of undifferentiated texture, some difficulty in shifting concepts, and personal references.

There was evidence of tension.

Follow-up continues, and Rorschach will be repeated 6 months after operation.

CASE 3.—A young man of 26, with an obsessional personality and life-long shyness, self-consciousness, lack of spontaneity, obsessional rumination and abnormal awareness of all his body movements, and a feeling that he was "forcing" himself about. Eighteen months prior to operation he became depressed and disturbed, with an acute onset of depersonalization. He felt outside himself, and speaking through his face. He felt he could see himself from all angles. Things and people looked flat and dull and only occasionally alive momentarily. He had 3 previous admissions to mental hospitals, and had received insulin coma therapy and 2 courses of E.C.T. with benefit. He had 5 weeks' exploratory psychotherapy, producing much material, and over 180 paintings with no improvement. He had difficulty in concentration and was unable to work.

Leucotomy was done in February.

He left after 3 weeks, and is at home awaiting a vacancy for an art school. He feels relief of tension, is more able to concentrate, and freed of his body awareness and self-watching. He still complains of lack of spontaneity and of feeling out of things. He dreams, but is unable to remember them though he makes an effort. The number of his paintings are much fewer, and his associations less in psychotherapeutic interviews which have continued. There is no discernible change in personality.

Psychological tests by Mr. Price, 2 weeks after operation, showed no significant alteration in scores. Speed and fluency, which had been a feature of pre-operative tests, were unaltered. There appeared a suggestion that he was rather less careful.

Rorschach testing was done before operation and again 6 days afterwards by Miss Alcock. It was abnormally long and strongly obsessional on both occasions and showed no significant change. General improvement appears to be moderate.

Complications.

1. Two major fits in one patient, 2 days after operation with none in the 6 months since then.

2. Incontinence of urine and faeces for one month, starting 3 weeks after operation and associated with exacerbation of psychosis, with an isolated incident 2 weeks later.

3. A rise of temperature on third and fourth day after operation, with no definite cause.

Amongst an additional group of 13 cases of transorbital leucotomy with the deep frontal cut, done at the invitation of another mental hospital, there was one death.

A paraphrenic patient became febrile 4 days after operation, and on the fifth day had signs of pneumonia and a meningitis which was pneumococcal, and died 2½ weeks later. At post-mortem there was a bronchopneumonia with a lung abscess in the left lower lobe, meningitis and an abscess in one frontal lobe. The holes in the orbital plate were normal. No air sinuses had been pierced.

Owing to a misunderstanding regarding post-operative treatment, the first 8 cases did not receive prophylactic sulphonamides, and this was probably a factor in the development of the infection. There have therefore been 2 deaths in 84 transorbital operations, a mortality of 2·3 per cent.

I have been informed that in this group significant improvements have been obtained in depression, severe anxiety neurosis, and in an acute schizo-affective psychosis of approximately 2 years' duration. These cases had not responded to other treatments. An obsessional disorder of 3 years' duration improved, but one of 12 years' was unaltered.]

Conclusions.

The main questions posed by the operation appear to be :

1. What is the relative effectiveness in relation to standard prefrontal leucotomy ?

2. If no improvement at all is obtained following transorbital with the deep frontal cut, is it worth while advising further leucotomy ?

3. If a good response is obtained, followed by a relapse after some months, can the same operation be repeated with safety and a more lasting result, or should standard leucotomy be advised ?

Tentative conclusions from experience so far are :

1. The deep frontal cut renders this operation more effective clinically than the original method.

2. Complications are few, and personality and intellectual defects still slight.

3. It is of most value in depression, anxiety and hypochondriasis in a depressive setting.

4. In obsessional disorder it is of no value unless in the first 2-3 years.

5. In long-standing cases of schizophrenia the value is as yet problematical. Improvements have been obtained, but it has yet to be seen whether these will last. It appears worth while, however, continuing to try transorbital in the first place if leucotomy is decided on, except in the aggressive deteriorated patients.

6. Finally, the clinical impression gained, taking into account all results to date, is that the relative effectiveness of original transorbital leucotomy is one-third, and with the deep frontal cut, two-thirds that of prefrontal leucotomy. No doubt this will need reviewing and modification in the light of later results.

I am grateful to Dr. Laptain for taking the X-rays and photographs illustrating this paper.

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THE SIGNIFICANCE OF VARIOUS ASPECTS IN DRAWINGS BY EDUCATIONALLY SUBNORMAL CHILDREN.

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I. INTRODUCTION.

DURING the past few years interpretations of drawings for the assessment of intellectual and emotional aspects of personality have been used frequently. Various scales have been designed on the basis of a correlation between the elaboration and complexity of a drawing on one side, and the intellectual capacity, as measured by orthodox intelligence tests, on the other side. The best known of these scales is Goodenough's "Draw-a-Man" test (13), which has been used extensively.

Very soon it was realized "that the drawing measures something which we might call the general maturity of the individual rather than the general intelligence measured by such an instrument as the Stanford Binet" (16), or, as has been suggested by others, that the drawing is an index of concept development, and stands for one aspect of general intelligence which "may or may not be closely related with other aspects of general intelligence" (15). When the observation was made that the Goodenough scale lost its value as an intelligence test when "applied to young delinquent subjects who are seriously warped and disturbed emotionally" (12), it confirmed the opinion of many that the "Draw-a-Man" test could be used as a projection test in clinical practice (5, 7, 16, 17, 23).

Some tentative attempts at interpretation of drawings by normal children were made (24, 25), but most of the investigations dealt with the deviations caused by abnormal psychological conditions (3, 4, 9, 16, 28, 29), until recent investigators provided more ambitious manuals for personality diagnosis (6, 19, 22).

There is, of course, no denial of the immense influence intellectual ability has on the execution of a drawing. Nevertheless, it seems certain that the lack of adjustment accounts nearly always for the differences between the intelligence level ascertained by orthodox verbal intelligence tests and the Goodenough I.Q. The conclusions reached by various investigators point to the view that the drawings, though certainly indicative of intellectual development under normal circumstances, are so sensitive to emotional influences that their value for intelligence assessment is nearly *nil* in the case of emotional disturbed subjects. Oakley (24) suggested, therefore, to interpret a drawing in the light of the known I.Q., and Buck (6) uses the difference between the I.Q. scored on his test and that derived from an established intelligence scale

for clinical diagnosis. Similarly, Brill (5) concludes that a discrepancy of 2 years or more between the Goodenough mental age and the Binet mental age can be used for diagnosis of maladjustment in mentally defective boys.

The drawings of mental defectives have usually been considered to indicate only intellectual inferiority, and investigators have agreed that they show the characteristics of normal, but younger, persons. Very little has been said about the emotional factors influencing their work, and it is, in fact, not quite clear how far the findings, collected in the normal population or in different clinical groups, are applicable to the very heterogeneous group of institutionalized subnormals. Earl's pioneer paper (10) on the drawing performance of adult defectives, which listed the characteristics of different clinical groups, has not been followed up by other investigations describing, in detail, personality types within the range of subnormality. There is, however, little doubt nowadays that the personalities of defectives vary in much the same way as with non-defectives and that these can be studied by projection tests, though allowances have to be made for the implications of intellectual subnormality.

Those investigators who have used the drawing test clinically have come to the conclusion that various features in the performance are typical or highly suggestive of certain personality traits (5, 9, 16, 17, 22, 29). The following investigation attempts to clarify the meaning of some of the features observed in the drawings made by educationally subnormal children, particularly studying the sex differences. This is important, as the influence of the "sex factor"* on the drawing performance has by no means been established beyond doubt, and because every interpreter must be able to view the individual case against the background of a group roughly comparable in sex, educational and social standing, and intellectual capacity.

In order to obtain an adequate "background" for clinical work two groups of children have been studied who show no significant differences in intellectual capacity or age, come, roughly speaking, from the same type of home, visit the same school and live in the same residential environment. The only fundamental difference is that of sex.

Drawing ability is said to be influenced by sex. Goodenough (14) quotes several investigators who agree that there are marked sex differences in favour of the boys. Burt (8) states quite decidedly: "In drawing, even among normal children, boys are eminently superior to girls; and among older children of special schools the difference is still more pronounced" (p. 325). On the other hand, Goodenough herself finds, on the basis of her very rigorous scoring system, "a small but consistent difference in favour of the girls at every age from 6 to 11 years" (14, p. 493). In this observation she is supported by the earlier report by McCarty (20), who finds that girls score slightly but consistently higher than the boys.

Strong doubts have been expressed by Burt whether these so-called "sex-differences" are inherent, and not, in fact, due to differences in school curricula and social environment. Many of the differences are, as Goodenough has pointed out, less quantitative than qualitative, and "appear to be based upon fundamental differences in the interests and attitudes of the two sexes"

* Sex factor refers in the following paper always to the sex of the artist.

(14). There appears to be so much disagreement among the various investigators that it seems necessary to establish independently the influence of the sex factor in the case of institutionalized educationally subnormal children, if the drawing test is to be included among the clinical diagnostic techniques. On the other hand, it must be pointed out in advance that the establishment of "sex-differences" in the present case does not deny the possibility, indeed the probability, of the influence of environmental factors, which may act in the direction of reinforcing and strengthening existing but slight sex-determined interests and attitudes.

II. THE SAMPLE.

The investigation is based on drawings obtained from 80 girls and 80 boys, all attending a residential special school for educationally subnormal children. The 80 girls comprised practically the whole girl population of the school between 13 and 15 - years of age at the time of testing. These girls were matched, as far as possible, individually with boys for age groups and intelligence quotients. Variance analysis confirms that the differences shown in Table I are not statistically significant. Thus, two samples were obtained, equal in age and intelligence, but differentiated by sex.

TABLE I.—*Composition of Samples.*

Group.	Sex.	Number.	Mean I.Q.	Standard deviation.	I.Q. range.
I	Boys	30	66.3	5.571	57-79
	Girls	30	66.5	7.06	56-80
II	Boys	30	66.2	6.754	55-78
	Girls	30	64.6	5.887	53-76
III	Boys	20	61.5	6.144	47-70
	Girls	20	61.9	4.46	54-71
Total	Boys	80	64.9	6.534	47-79
	Girls	80	64.7	6.477	53-80

Group I comprises children born in 1935, Group II those born in 1934, and Group III children born in 1933. The drawings were obtained in March, 1949, and the groups correspond therefore roughly to the age groups 13 to 15 +. All children were under 16 years of age.

The fact of institutionalization indicates that many of these children were maladjusted, which necessitated regular supervision. Many of the children were delinquent or presented serious behaviour difficulties at home. Others are orphans, illegitimate or come from broken homes, and the residential special school acts as a place of custody. All children are educable, and the majority leave at the age of 16 for employment under ordinary conditions.

The school is housed in the grounds of a colony for adult mental defectives, but the children do not ordinarily mix with the adults. They live in "homes," each having approximately 50 beds, and are, outside school hours, under the supervision of trained nurses of either sex. On five days of the week they go to school, which is not open to non-residents. The school curriculum is the same as that of any special school, and the teachers are trained and qualified.

"Art work," comprising drawing and painting, is included in the curriculum, and both boys and girls receive an equal amount of instruction. The children go home twice a year—if a "home" is available and suitable—for the Summer and Christmas holidays, but otherwise spend all their time in the school, "home," or playing fields.

This description applies to both sexes alike, but mention must be made of the fact that this particular school is experimental in character, and that results obtained there, are not necessarily typical for residential special schools in general. A short summary of facts which may have bearing on the findings of this paper is therefore advisable.

The education of maladjusted and educationally subnormal children in a residential special school necessitates careful experimenting with differing environmental conditions taking into account sex, age, type of behavioural problem and susceptibility to a broad group therapy. Thus, this residential school has developed, in course of recent years, an environmental treatment which is tuned to the needs of the children, and tends in consequence to strengthen any sex-determined characteristics. It would lead too far to describe in detail the differing environmental treatment children of opposite sex and different age receive. Suffice it to say that, generally speaking, the boys of this sample have more opportunities to assert themselves in games against outside schools and clubs than girls, go regularly on weekly "parole," have "jobs" outside the institution (newspaper delivery, gardening) and have generally more outside contacts. In view of the danger of sexual misbehaviour, much of this has of necessity to be withheld from the girls.

It is possible that this comparative scarcity of environmental stimulation may be responsible for certain typical features in the drawings by the girls, which assume in consequence the character of "femininity indicators," though they may be primarily due to environmental influences. The comparative lack of stimulation in an institution may limit the girl more than usual to her sex-determined interests (fostered particularly by the all-female environment), and may lead in consequence to a perhaps more than usual reinforcing of the feminine aspects. Thus, the girls tend to stress "feminine aspects" in their drawings, appear to be disinterested in features dependent on object-interest, and seem to register subconsciously their "feminine protest." The boys, favoured by their environment, follow their natural bent and show strongly in their drawings the interest usual in boys of their age. Moreover, since our civilization pattern and the residential school treatment agree in giving them comparatively more freedom than the girls, they have neither need to protest nor cause to feel "wronged."

Other factors, too, may be operative and may blur the picture of purely sex-determined characteristics. Length of residence, court record, home environment, rural or urban origin, frequency of leave, sexual maturity, etc., may conceivably be included among possible factors contributing to the sharp differentiation between the girls' and boys' drawings described. Even the selective procedure responsible for acceptance to the institution in the first place may have operated differentially between the sexes by admitting certain personality types more frequently. In short, though the sample discussed

is representative of the children of the age groups from 13 to 16 in this particular institution, it would need additional investigations in similar institutions before valid generalizations could be made. In the meantime, this report assumes that such differences as shown are mainly due to sex, but that a strong environmental factor is also in operation.*

III. THE TEST PROCEDURE.

The children were tested in small groups, varying from two to four, each child sitting at a separate table which precluded copying from the neighbour. Since testing is frequent and a commonly accepted feature of the institution routine, no explanatory introduction was thought necessary. The children were told their first task, and after completion of the drawing, their next. As soon as a child had completed the series of drawings, he left the room and was replaced by the next. The testing was done by three male examiners, and a statistical analysis showed that results were not influenced by this division of labour.

Each child was first asked to draw "a house" and the usual admonitions to do his best and to make it a really "good house" followed. No standardization of these instructions was attempted, but it was impressed on the child to do his very best. After the drawing of the house had been completed, the child was told: "Now, I want you to draw a tree, a really good tree, on the same paper," again followed by the usual words asking him to try very hard. After completion of this subject a new instruction was given: "Now, I want you to draw a person. Any sort of person you like. It does not matter which way you draw the person, but see to it that it is a good drawing. A person from top to bottom," or words to that effect. Then a new sheet of paper was handed to the child. Special care was taken not to refer to the "person" by a pronoun which would have suggested the sex. When this drawing had been finished, the instruction was altered to "Now draw a man" or "woman" depending on the sex of the human figure drawn previously. The child received then a third sheet of paper.

The drawing paper (5 × 8 inches) was given directly into the hands of the child, and never put down in front of him. The examiner passed it on, holding one corner, with the opposite corner pointing towards the child. In this way it was hoped to reduce considerably the suggestive element and to give the child a better chance to select the position he thought most suitable for the subject he was about to draw.

An unobtrusive check on time was kept, though only to the nearest half minute, and with an ordinary watch. The children were frequently asked to be careful, to take their time, not to hurry and to make sure that they really did their very best. It is very likely, however, that the group situation reduced

* Throughout this report the statistical significance of observed differences has been established by Fisher's "t" or χ^2 with Yates' correction as appropriate. In order to simplify the presentation, the results of those tests have been indicated thus:

p — .01 and under	++++	highly significant.
p — .02 — .05	+++	significant.
p — .05 — .10	++	trend towards significance.
p — .10 — .20	+	mild trend.

generally the average time spent on drawing, since a child was often induced to finish a drawing quickly when he or she saw other children leaving the room.

IV. GENERAL ASPECTS.

(a) *Position of Paper.*

Owing to the procedure described above, each child was able to place the drawing paper in the most convenient position. The two subjects (House, Person) being of different spatial orientation, seem to suggest at once a different positional placing of the paper, if satisfactory proportions are to be maintained. The house, being mostly an oblong resting on the longer side, is best drawn with the paper's longer side parallel to the side of the table at which the child is sitting. The upright human figure, on the other hand, seems to demand a position of the paper where the two longer sides of the paper are parallel to the body axis of the person drawn. We shall refer to the first position as the "Horizontal" (H), and to the second as the "Vertical" (V) position.

Little has hitherto been said about the significance of how the child uses differing size and shape of paper for drawing different subjects (2). The H-T-P test excludes the possible diagnostic significance of choice and change of format by confining the testee to prescribed positions. Oakley (25) found that the horizontal position of the paper was used in less than 2 per cent. for drawings of a man. This extremely low figure may perhaps be due to the manner of handing the paper. Oakley remarked that this particular position may be more closely related to introversion than adolescence.

Table II indicates that seven different combinations of paper positions for three different subjects have been used by the children. Two position combinations (HHH, VVV) have been considered "rigid," since the child was either unable or unwilling for one or the other reason to make use of the possibilities of different position choices, though he paid enough attention to continue with his original choice. The satisfactory solution, "horizontal" for the house and "vertical" for the two persons (HVV), has been referred to as "flexible" position choice. The remaining combinations of a "mixed" type could be ascribed to chance, and seem to indicate that the child did not pay any attention to the format of the paper.

TABLE II.—*Position of Paper for "House," "Man" and "Woman."*

Position.	Boys.					Girls.				
	Age groups.				Total.	Age groups.				Total.
	I.	II.	III.			I.	II.	III.		
"Rigidity"										
HHH	11	8	7	26	47.5	22	22	13	57	86.25
VVV	3	4	5	12		4	5	3	12	
"Flexibility"										
HVV	14	15	7	36	45.0	2	1	3	6	7.5
"Mixed"										
HVH	1	..	..	1	7.5	..	..	..	..	6.25
HHV	..	2	1	3		..	1	1	2	
VHV	1	..	..	1		..	..	..	..	
VHH	..	1	..	1		2	1	..	3	
Total.	30	30	20	80	100	30	30	20	80	100

It is obvious from the figures that the "flexible" position is comparatively neglected by the girls, though well emphasized by the boys. An overwhelming majority of the girls failed to produce a pleasing and balanced arrangement of drawing and format, keeping particularly to the horizontal position throughout the series.

The lack of flexibility can not be ascribed to varying degrees of intelligence, since the boys do not differ significantly in intelligence from the girls in this sample. It may be regarded as a special feminine characteristic, though it is difficult to see the direct relationship between sex and unimaginative handling of the situation. Instruction in manual work, as enjoyed by the boys (woodwork, etc.), may perhaps have contributed to this particular aspect.

Children who draw small, will perhaps find no need to choose a paper position which permits a large drawing, whilst other children, used to drawing on a big scale, will of necessity select that position which is most suitable for their purposes. As the following section will show, the girls of this sample draw smaller than the boys, and they may therefore have "overlooked," or not looked out for, the opportunities offered by the vertical position. However, this does not account completely for the rigidity of position, since even large drawings of the human figure, which would more adequately be accommodated in the vertical position, are squeezed into the horizontal position, touching both edges of the paper.

In this connection reference to the suggestions of interpreters of drawings may offer a clue to the significance of the position choice. It has been assumed that the drawing paper represents symbolically the environment to the child, and the classical drawings of tiny, support-seeking "men" squeezed closely into the sheltering corner of the drawing paper by the timid artist seem to support this hypothesis. The horizontal position of the paper, with the top edge near the child, seems to suggest narrowness and lack of space, whilst the vertical position is pointing outwards and implies spaciousness. This position invites large-scale drawing for the human figure, a venturing out into space, which is made impossible in the horizontal position, where pencil movement is only possible sideways. This is neither in accordance with the subject of the human figure nor does it lead "away" from the artist. The horizontal position, with its small height, sets a limit to the size of the drawing of the human figure, or "ego-projection," which is thus hemmed in and more or less supported by the closeness of the limiting edges.

Interpreters will probably find that the various combinations of drawing size to paper size, and the adequacy of the paper position chosen, will supply valuable clues for diagnostic purposes. The drawing paper, in its various positions and with its opportunities for projection and display, may very well indicate symbolically the child's attitude to, and his position in, his environment.

A striking and suggestive feature, perhaps comparable to the position choice, is found in young children's paintings (1). Children who emphasized vertical brush strokes or vertical features "were likely, as a group, to be assertive and outgoing, to show a constructive pattern in their activities, and to be rational in their thought processes. Among them, masculine, rather than feminine, interests predominated. Emphasis on verticals was pronounced

in the more 'typical' boys, i.e. in boys with outgoing self-confident, assertive mannerisms, many of whom seemed already to have identified themselves with older boys or men. . . ." (p. 58). Or: "Parallels between behaviour and use of circular and/or vertical patterns suggest the following tentative conclusions: (a) A maturity difference—whereas circular emphasis seems to reflect and to be associated with relatively infantile (emotional, subjective, dependent) tendencies, vertical emphasis tends to reflect a relatively more mature (more rational, more objective, more self-reliant) pattern. (b) A sex difference—whereas circular emphasis reflects relatively feminine tendencies, vertical emphasis tends to reflect a more masculine pattern. (c) A general personality difference—whereas circular emphasis seems to reflect and to be associated with more self-centred, withdrawing, inturned personality, vertical emphasis tends to reflect a more outgoing, assertive individual." (1, p. 59).

It has also been suggested that the prevalence of the pycnosomatic type among the girls, and of the leptosome and athletic types among the boys of this sample may have influenced this particular feature of the drawing test. This is a promising line of research, which, it is hoped, can be followed up in a future investigation.

(b) *Size of Drawing.*

The wide variations in sizes of the human figure drawings have been utilized by Machover for clinical interpretations. "It is probable that the size and placement of a figure are less subject to conscious control and variability than other structural aspects of a drawing. . . . The very large figure, placed aggressively in the middle of the page, is seen most often in the grandiose paranoid individual who possesses a high fantasy self-esteem. This treatment is quite different from the paranoid conditions usually associated with chronic alcoholism, involutional changes, or senility. In these latter cases the self-esteem is definitely not high, and the figure is correspondingly small. . . ." (22, p. 90). It would lead too far to quote in detail Machover's treatment of size, which, of course, does not use merely the foot rule for interpretation. It is, however, clear that the size of the drawing is of considerable diagnostic significance, once variables, due to technical limitations, have been eliminated.

Bell (2), summarizing the conclusions of previous investigators, interprets small drawings as indicating "inability to function freely in whole environment," or "compulsion neurosis," whilst large drawings where only part of an object is drawn, is quoted as indicating "potential ability of making contact with the surrounding world."

It is obvious that the size of the drawing depends to a great extent on the way in which the paper is placed. The height of the human figure in the drawing is, for example, definitely limited by the horizontal position of the paper preferred by the girls. Comparison of sizes of drawings must therefore first of all take into account the sizes and positions of the drawing paper. Table III sets out the means and standard deviations of height and width

of the house, and the height of the human figures as drawn by the two sexes. It becomes at once apparent that throughout the test the boys tend to draw significantly larger than the girls. This can be seen in the drawings of the house, where the differences in height as well as in width are statistically significant, and in the drawings of people, where even the cramping horizontal position does not obliterate the unmistakable tendency.

TABLE III.—*Sizes of "House," "Man" and "Woman."*

Subject.	Boys.			Girls.			Significance of differences between sexes.
	N.	Mean.	Standard deviation.	N.	Mean.	Standard deviation.	
House (horizontal position) :							
Width . . .	67	3.65	1.23	65	2.96	0.895	++++
Height . . .	67	3.42	0.981	65	3.04	0.906	+++
Man :							
Horizontal position . . .	31	3.33	0.897	60	2.83	0.874	+++
Vertical position . . .	49	4.88	1.427	20	3.52	1.355	++++
Total . . .	80	4.28	1.459	80	3.00	1.06	++++
Woman :							
Horizontal position . . .	28	3.10	0.869	63	3.14	0.678	.
Verical position . . .	52	4.83	1.503	17	4.12	1.555	+
Total . . .	80	4.23	1.555	80	3.35	1.153	++++

Oakley's investigation (25) offers opportunity for comparing sizes of the drawings of a man executed by 430 normal children (10-14 years of age) with those of our sample. Though Oakley used the same size of paper (5 × 8 inches), he did not differentiate by position, since he found the horizontal position "uncommon." Table IV, comparing Oakley's percentage figures with the percentage distribution obtained in the present sample, indicates clearly that the performance of our boys resembles closely that of normals, but that our girls differ markedly from the normal children population. Whilst normal girls tend to draw larger men than the boys, the girls of our sample draw much smaller men than their contemporaries of the opposite sex. The data given by Oakley are too scanty to venture an explanation, but the interesting agreement between Oakley's and the present findings support, or at least do not contradict, the assumption that the size of the drawing may be influenced by emotional factors.

Emotional factors are assumed to play a decisive part in the interesting facts revealed in Table V. This table shows, with respect to sex of the artist, age, set of the paper position, and the sex of the first drawn human figure, the significance of the difference between the mean sizes of the male and female drawings. All pairs (Man, Woman) drawn on papers in different positions were excluded, which left 27 horizontal sets (HH) and 48 vertical sets (VV) for the boys, 60 horizontal (HH), and 18 vertical (VV) sets for the girls.

The girls show, in their preferred paper position (HH), a statistically significant difference in the size of the two sexes drawn, the woman being

TABLE IV.—*Sizes of "Men" of Two Different Samples.*

	Boys.					Girls.				
	Subnormal: this sample.				Normal Oakley's sample. %	Subnormal: this sample.				Normal Oakley's sample. %
	Hori- zontal.	Verti- cal.	Σ.	%.		Hori- zontal.	Verti- cal.	Σ.	%.	
Up to 1"	..	..	..	..	..	..	..	..	..	..
" 2"	3	..	3	3.7	2.8	12	2	14	17.5	2.4
" 3"	9	5	14	17.5	14.2	26	8	34	42.5	12.6
" 4"	11	14	25	31.2	31.4	16	4	20	25	28.4
" 5"	7	9	16	20	26.1	6	2	8	10	31.3
" 6"	1	6	7	8.8	17.3	..	3	3	3.7	18.3
Above 6"	..	15	15	18.8	8.2	..	1	1	1.3	7.0
Total	31	49	80	100	99.9	60	20	80	100	100

TABLE V.—*Differences in Sizes of Human Figure.*

Age group.	Own sex drawn first.				Opposite sex drawn first.				Total.			
	N.	Mean men.	Mean women.	Signifi- cance.	N.	Mean men.	Mean women.	Signifi- cance.	N.	Mean men.	Mean women.	Signifi- cance.
Boys:												
HH I	10	3.42	3.02	+	1	..	..	..	11	3.44	3.11	+
HH II	8	2.67	2.82	..	1	..	..	..	9	2.82	2.94	..
HH III	4	3.57	3.72	..	3	3.13	2.93	..	7	3.39	3.39	..
Σ	22	3.18	3.08	..	5	3.42	3.34	..	27	3.22	3.12	..
VV I	13	4.9	4.22	++	4	5.15	5.42	++	17	4.96	4.50	+
VV II	19	5.22	5.13	..	0	..	..	..	19	5.22	5.13	..
VV III	11	4.45	4.62	..	1	..	..	..	12	4.43	4.68	..
Σ	43	4.93	4.72	..	5	4.96	5.42	..	48	4.93	4.79	..
Girls:												
HH I	21	2.79	3.17	++++	3	3.2	3.57	..	24	2.84	3.22	++
HH II	19	2.99	3.3	+	4	2.65	2.82	..	23	2.93	3.21	+
HH III	9	2.44	2.73	..	4	3.17	3.82	..	13	2.67	3.0	+
Σ	49	2.8	3.14	++++	11	2.99	3.39	..	60	2.84	3.18	++
VV I	5	3.78	4.96	++	1	..	..	..	6	3.57	4.72	+
VV II	6	3.62	4.18	..	0	..	..	..	6	3.62	4.18	..
VV III	5	3.94	4.04	..	1	..	..	..	6	3.75	3.77	..
Σ	16	3.77	4.38	+	2	..	..	..	18	3.64	4.22	+

much larger (3.18 inches) than the man (2.48 inches). The same trend is shown by the girls who use the VV position. The boys, on the other hand, do not show in the total sample any differentiating treatment of statistical significance.

Generally speaking, it appears that the girls in the present sample draw, in the majority of cases, their own sex considerably larger than the opposite sex, whilst the boys do not commonly differentiate the sexes by size.

The breakdown according to age group reveals that the differential treatment of the human figure in favour of the artist's own sex is without exception most pronounced in, and largely due to, the youngest Age Group I. The high statistical significance of the difference between the means of the HH group executed by the girls, is already observable in the 24 girls belonging to the youngest age group, and is marked in the other two age groups. The youngest boys, too, show a tendency to draw their own sex significantly larger than the opposite sex, but this trend disappears entirely in the larger sample composed of all three age groups.

It appears therefore that age, too, may have a decisive influence in the differentiating handling of the sizes of the human figures. The younger and more immature age groups draw their own sex significantly larger than the opposite sex; this tendency tends to disappear with increasing age in the boys' drawings, but remains marked in the girls' drawings.

It is conceivable that the human figure drawn first may be larger than the second figure, where a certain adjustment has taken place, and that the size of the figure may therefore depend on the sequence of the drawings rather than on the sex factor. To test this hypothesis the drawings were divided into two groups, the first group containing all children who drew their own sex first, the second group comprising those who drew the opposite sex first. Of the latter class there were only few, but the means indicate throughout the breakdown, with one exception (Boys VV), that the children drew their own sex larger, even if it came second in their choice of sequence.

The one statistically significant exception in the VV drawings of the boys (Group I), where the opposite sex is drawn larger, is rather interesting. It may perhaps be explained by the assumption that the same factor responsible for the atypical choice of the opposite sex as the "first person" may have caused its atypical enlargement, or that the small group of four happened to be of an atypical composition.

The columns indicating the means and significance of the drawings, with the artist's own sex drawn first, show the already previously observed tendency of the young age groups to differentiate significantly between the sexes.

The statistical treatment of the size of the drawings has brought out two facts very clearly. Generally speaking, the boys tend to draw larger than the girls, and the girls tend to draw their own sex taller than the opposite sex. The explanation of these tendencies may perhaps be found by reference to the observation that the younger age groups, irrespective of sex, draw their own sex larger than the older children. It appears, then, that the first impression of attributing to the girls in general a very marked tendency to emphasize their own sex, may have to be modified. Rather than being a sex characteristic, the peculiar drawing feature may indicate immaturity. Emphasizing one's own sex and literally belittling the opposite sex may in most of the present cases be the result of autistic and egocentric phantasy life, but may also be due to an unconscious attempt of the thwarted child at overcompensation. The statistical analysis reveals that the older boys show less often this "sign of immaturity" than the girls. This must, of course, not be interpreted as indicating the boys' general maturity as measured by normal standard, but merely as showing comparatively more maturity than the contemporary girls of the same intelligence level.

As pointed out before, the tendency to enlarge one's own person or sex at the cost of the opposite sex may not only be due to the child's egocentric approach to the world, but also, particularly in slightly more mature children, to a need to emphasize one's own place and importance. Real or supposed preferential treatment of others may lead to immediate reaction, as exemplified in our sample by some girls' drawings which do not find parallels in the boys' productions. The "feminine protest" of the girls is shown unmistakably

in a few cases in a not uncertain way, e.g. a schoolboy standing on his head, a scarecrow with the added written explanation "this is a scarecrow. It is a funny man," or "a clown" instead of a man. An indication of the intensity of emotional rooting is given by the fact that in each of the three cases the opposite sex was drawn first, but made ridiculous at the same time.

(c) *Elaboration of Drawings.*

The clinical significance of elaboration of details is rather dependent on the quality of detailing, its accuracy, and on its relation to the whole picture. Bell (2) refers to numerous publications concerning the abnormal and sub-normal population and it is, of course, well known that Goodenough's scoring for intelligence depends on the number of details depicted. The detailing of a drawing is indeed vital for interpretative purposes, and the analysis of a drawing becomes richer in proportion to the wealth of details.

Many investigations have compared drawings made by girls and boys, and have usually agreed that the girls are better in their representations. McCarty's report (20) found that "according to the median scores, boys and girls are nearly equal in the quality of their representations of houses." The same report, referring to the human figure drawings, states that girls draw considerably better than the boys, and adds that this superiority, "while not great, is consistent through all the years of all the grades." Considering more recent reports with more adequate statistical treatment, we find that Goodenough (13, 14) reports that the test score favours the girls who draw neater, prettier and with much more detail. Burt (8) refers, with the following words, to the girls' superiority; "girls excel in delineating minute particulars; . . . in the fullness of detail, both as regards the incidents in the story to be illustrated, and as regards personal peculiarities like those of dress, girls everywhere surpass boys."

Detailing has been considered generally as an indicator of varying degrees of intelligence. Buck states "that there is a progressive increase in the number and quality of details presented as one goes from the drawings of subjects of the imbecile level to those of the superior level" (6, p. 344). Burt points out the influence of sex if an estimate of general ability on the basis of drawing is attempted. "Although . . . the correlation between ability in drawing and general ability is, among boys and particularly among older boys, by no means large, yet among girls, and particularly among younger girls, it is in no way negligible. . . . Among girls the specific talent for drawing is small and plays but a slender part. A young girl's drawing depends largely upon her general ability. Consequently, for the diagnosis of intelligence, to rely, in part, at any rate, upon accomplishments in drawing is somewhat safer with a girl of 8 than it would be with a boy of 12" (8, p. 325). The influence of emotional and socio-economic factors has been recognized. Geil (12), for example, states that "in cases where there is a noticeable lack of clothing representation in the presence of adequate tested intelligence, then it becomes a sign of maladjustive import, indicative of probable emotional immaturity." Environmental influence is discussed in the study by Havig-

hurst, Gunther and Pratt (15), who explain the varying performances of the sexes on the Goodenough test as being largely due to the varying stimulation offered by the environment. Their theory explains not only the differences found among the sexes, but also the relative better performance of Indian children compared with white children. "The children of Indian tribes which have kept close touch with the world of nature and with their indigenous cultures are specially stimulated to observe accurately, to organize their observations and express them aesthetically, and thus they may be expected to do well on the "Draw-a-Man" test. . . . We should expect the Indian groups which have been most adapted to the white culture to test more nearly the same as white children." Similarly, Oakley (25) found "that the ability to draw a man is influenced by social factors."

In order to score the drawings roughly as to the degree of elaboration, a simple point system, based on the number of details was evolved empirically without taking into account the quality of the drawing. It was felt that differentiation should be made between commonly drawn features, as revealed by inspection, and more unusual details. The weighted point system shown in Table VI was the result.

TABLE VI.—*System Used in Scoring for Detail of "House,"
"Man" and "Woman."*

	House.		Person.
1 Point	Indication of different nature of roof by shading, showing tiles, etc.	Hat.	Cigar.
	Indication of brickwork in chimney.	Trousers.	Coat.
	Window crosses	Jacket.	Shirt.
	Curtains at windows.	Pockets.	
	Doorknob.	Shoes.	
		Buttons.	
		Pipe.	
		Stick.	
2 Points	Indication of brickwork of the house.	Tie.	Bag.
	Indication of woodwork.	Collar.	Necklace.
	Housenumber.	Heels.	Jewellery.
	Rain pipe.	Belt.	Dress.
	Rain tub.	Watch.	
	Letter box.	Shoelaces.	
	Window flower boxes.	Button-holes.	
	Other details.	Bow.	
		Other details.	
3 Points extra		For recognizable costume or dress.	

An inspection of the final scores reveals at once that the girls score generally far below the boys. Though all the children were given the same instructions and understood very well that the term "good drawing" translated into their language meant a "neat drawing with a lot of things in" the girls put far less work into their drawings than the boys. This is already shown in the schedule of approximate times. The three age groups of the girls used (I) 4.1, (II) 3.9 and (III) 4.3 minutes to finish their house, whilst the corresponding age groups of the boys used 7.4; 9.4; 6.8 minutes for the same task. The same tendency is seen when comparing the time taken over completion of the human figure. The girls use, on average, 5.3 minutes for the first figure drawn, and 4.7 minutes for the second figure (5.3; 5.1; 5.5; 4.2; 5.2; 4.9), the boys 6.8 minutes

for the first, and 5.6 minutes for the second person drawn (6.8 ; 7.4 ; 6.1 ; 5.5 ; 6.2 ; 4.9). No statistical significance has been computed owing to the inexactness of time-taking. But it is obvious that these approximate times correlate closely with the scarcity of detailing shown in the average scores (Table VII).

TABLE VII.—*Comparison of Scores in Detailing of "House," "Man," and "Woman."*

Subject.	Boys.		Girls		Significance.
	Mean.	Standard deviation.	Mean.	Standard deviation.	
House	6.42	3.642	4.02	3.243	++++
Man	6.65	4.752	3.80	3.471	++++
Woman	4.58	3.207	4.43	3.255	..

The girls' unsatisfactory execution of the drawing task may partly be attributed to the situation with "strange men" administering the test, partly to adolescent shyness and girlish timidity. However, the general quality of the drawings suggests that such factors could have contributed very little, if at all. As far as the girls' performance in the drawing of the house is concerned, the poor quality of work is perhaps less due to a general tendency of "skipping it" than to the fact that they "had nothing to say." After having drawn the essentials, e.g. the oblong representing the house, roof, chimney, windows with curtains, and doors, nothing else seems to have impressed them sufficiently to be considered worth recording. On the other hand, the boys know far more about the house and are interested in it as a structure.*

Detailing is, as shown clearly by the figures in Table VII, largely a question of interest. In the drawings of persons, for example, the girls manage to score higher in their representations of women than of men, though not to a statistically significant extent. Their poor draughtmanship may be held responsible for that. The boys, on the other hand, who always obtain higher scores on the average than the girls, differentiate significantly in their elaboration of drawings of men and women. This is not contrary to expectation, and no other explanation than the obvious one of familiarity and identification need be assumed.

The results of this investigation throw some doubt at the usefulness of the "Draw-a-Man" test when applied to girls of similar standing as those in this sample. Though the girls are comparable to the boys of this sample in chronological age and intelligence, they give a generally poorer drawing performance and draw less elaborately than the boys. The differences between the sexes in their execution of the house and the man is statistically significant and only in the drawing of a woman no statistically meaningful difference was found. In other words, generally speaking, the poorest productions of the boys are just equal to the best efforts of the girls.

* Herbert Read (26) observes "that boys emphasize the functional aspects (doors, windows, chimneys) and the dynamic aspects (smoke from the chimney), use a thick, forceful line and strong colours; whereas girls emphasize details (curtains), environment (garden, trees), use a thinner line and more delicate colours. These are rather obvious expressions of sexual characteristics and are only significant for the determination of intersexual tendencies."

V. PARTICULAR ASPECTS.

(a) *House.*

Though McCarty (20) had reported that next to the human form, which is the most popular of all objects drawn (10.5 per cent.), the house comes second with 13.0 per cent., the interpretation of drawings of houses has not received as much attention as that of men. Nevertheless, Kerr (18) attempted to scale the drawings of houses on parallel lines to Goodenough's technique, and Buck (6) has recently devised an elaborate scoring method for the purpose of personality interpretation.

TABLE VIII.—*Characteristic Differences in the Treatment of the "House."*

	Boys.		Girls.		Significance.
	Mean.	Standard deviation.	Mean.	Standard deviation.	
Score in detailing . . .	6.42	3.642	4.02	3.243	++++
Size of house (in horizontal position):					
Width . . .	3.65	1.23	2.96	0.895	++++
Height . . .	3.42	0.981	3.04	0.906	+++
	Number.	%.	Number.	%.	Significance.
Four-corner-window pattern . . .	22	27.5	56	70	++++
Fifth window . . .	10	45.4	12	21.4	++
Small windows . . .	16	20.0	51	63.75	++++
Transparencies . . .	0	0	6	7.5	not tested.

One of the most frequent and well-known features in drawings of houses is the placing of windows right into the corners of the building, or leaning against the two vertical lines representing the wall of the house. Kerr's sample of 555 normal children, 70 mental defective and 60 emotionally disturbed children, all between the ages of 6 to 14, shows a much less frequent occurrence of corner windows than the present sample, though her figures do not permit comparison with our sample because no information is available about the sex composition of her sample. Her percentages are: 8.2 ± 1.1 for normal, 15.0 ± 4.6 for neurotic, and 14.2 ± 4.1 for mentally defective children. Kerr's differences are not statistically significant, but reference is made to the general observation that "children who put the windows in the corners are over-anxious individuals." The corresponding figures of our sample are considerably larger. For the total population the percentage is 48.75 ± 3.9 , and the breakdown according to sex shows a highly significant difference, the girls using the four-corner-window pattern in 70.0 ± 5.1 , the boys only in 27.5 ± 4.8 per cent. of the cases.

The four-corner-window pattern leads to an interesting sequence. On account of the extreme edge position of the windows a great blank space is left in the centre of the house. This is a glaring disproportion which simply asks for a remedy. Many of the children hit on the obvious solution of providing a fifth window at the intersection of the diagonals. Comparing the boys,

who added the fifth window to the typical four-corner-window pattern, with the girls doing the same, shows a statistically significant difference in the samples. No reference to this particular feature has been found in the literature.

Another feature, differentiating between the two sexes, has been found in the size of the windows. Girls draw small windows (size subjectively estimated) far more frequently than the boys.

An interesting problem is offered by the well-known "transparency" which is found in the present sample in 3.7 ± 1.5 per cent. of the cases. These drawings show, besides the usual door and windows, interior details like table, chairs, staircase, lamp, etc. Kerr's percentage figures are 1.2 ± 0.45 for normal, 6.6 ± 3.2 for neurotic, and 7.1 ± 3.0 for mentally defective children. As explanation, Kerr offers the suggestion that the child is "out of touch with reality." Buck again states that "the details seen within the house in such instances may be regarded as having the same interpretative status as the irrelevant details drawn outside the house by more intelligent subjects who have a compulsive need to structure the situation as completely as possible. The mentally deficient subject, by his use of interior details rather than exterior, seems to point out his feeling of inadequacy in situations that are not thoroughly supportive and protective" (6, p. 375).

As has been shown previously, the girls are generally not interested in the task of drawing a house. They pay little or no attention to the external structural details of a house, and, we may surmise, are probably more interested in the interior of the house. The four-corner-window pattern and the frequent smallness of the windows raises for many children the problem of the "horror vacui." Most of the boys are able to overcome this feeling of incompleteness by placing a fifth window in the centre and so remaining within the framework of their structural task. To the girls this space seems to offer a point of penetration which induces them to think rather of what is behind the wall than of a means to fill the space by appropriate details. Thus, though our figures are too small to be more than merely suggestive, it can perhaps be considered significant that none of the 80 boys showed "transparency," whilst six girls drew items only found in the interior of the house.

Placing the window right into the corner is characteristic of an early developmental stage, and betrays the child's need of leaning against something, of support, and of his fear of venturing into space. If the four-corner-window pattern is thus indicative of feelings of insecurity, which may be so overpowering that the demands of reality are neglected, the introduction of the space-filling fifth window may be regarded as an attempt to take into consideration the requirements of the objective situation. The fifth window, often placed as an afterthought when the child is struck with the disproportion of the building he has drawn, may symbolize his attempt to reconcile his affective life with his rational thinking. It is an attempt at reality thinking, and it is perhaps not surprising that this should happen more frequently in the boys than in the girls of our sample.

The girl is interested in "domestic reality," the homely atmosphere of furniture, curtains and flowerpots, where she feels secure and which she regards as her own special sphere of activity. She neglects the objective reality

of bricks and mortar, rainpipes and housenumbers to which the boy devotes his attention. For her the "house" is primarily a "home," for the boy it is a "structure." The girl's interest is centred on the inside of the house, and therefore her windows are generally small, just sufficient to look out of them. They are not considered essentials in the same way as the space enclosed by the four walls.

Whilst it is true that the transparency feature is certainly indicative of a certain lack of sense of objective reality, an estimate of the degree and the emotional rooting must take into account, intelligence, age, and sex of the child. Transparency shown in a girl's drawing may be of far less diagnostic value than when occurring in a drawing by a boy. In the first case it may show merely immaturity and self-centred reality thinking, in the second case it may be indicative of severe disturbance of reality thinking.

(b) *Tree.*

As has been shown in the introduction, the drawing of the tree did not receive the same attention in the design of the experiment as the other three subjects. The tree has figured very little in projection tests, though its symbolical meaning has been recognized. It has been included in the H-T-P test (6), and has recently been developed into a projection test by Koch (19). Herbert Read (20) has demonstrated a "correlation of temperamental disposition with graphic modes of expression" by the example of a series of drawings of trees, but since his is a completely intuitive approach, no scientific evidence is offered. No comparable figures or references have been found for the following observation referring to sex differentiation.

Generally speaking, the present sample suggested little beyond a classification of drawings under two headings with certain subdivisions.

Type A is merely the drawing of the tree trunk and a crown without indications of branches. The crown is usually round, and in a few cases elongated. Its circumference is mostly an irregular zigzag line with scribbling inside representing leaves.

Type B disregards the foliage altogether and attention is concentrated on the branches. The manner of representation varies from simple straight lines originating from the top of the trunk to a great number of inter-connected long and short lines, imitating, more or less faithfully, the branches.

A combination of these two types, AB, shows branches as well as the foliage.

A typical subdivision of the second type, BA, shows branches in the usual manner with carefully drawn leaves attached to them. The intention is apparently the same as in AB, but it does not reach that level of structural unity. It seems, moreover, to imply a different approach, emphasizing the detail rather than the whole.

Table IX sets out the occurrence of the different types in the drawings.*

* Kerschensteiner, in his *Die Entwicklung der zeichnerischen Begabung*, quoted by Helga Eng (11), differentiates the following formalized shapes of trees: "broom formula" and "feather formula," which correspond to type B; the "coil formula," corresponding to type A, and a "lobate formula," where the "foliage is given as a lobate outline added to the trunk."

TABLE IX.—*Frequency of Different Types of Trees.*

Type.	Boys.	Girls.	Significance.
A. Foliage only	29	27	..
B. Branches only	26	26	..
AB. Foliage and branches	17	2	++++
BA. Branches with decorative leaves.	8	25	++++
Total	80	80	..

The table indicates that the basic types A and B occur to the same extent in both sexes, but that there are significant differences in emphasis in the two subdivisions, AB and BA. The test for statistical significance supports the impression that the boys prefer the type AB, whilst BA seems definitely characteristic for the girls.

Type AB appears to be a more mature attempt at representation of trees than BA, or even the basic types A and B. Whilst types A and B take into consideration only one essential characteristic of the tree (foliage or branches), type AB combines both features on a mature constructional level. BA appears to be a sort of half-way house to AB, emphasizing the detail rather than the whole, and being more decorative and symbolistic than any other type. (It is extremely unlikely that this type is meant to represent the tree in autumn which, indeed, shows the characteristic leaves at the end of branches. It is, however, possible that instruction in embroidery at school may account for the frequency of this type of representation.)

It is suggested that the type AB is the most mature representation of the tree and is characteristic for the boys. The decorative type BA may indicate a less mature conceptual level, is characteristic for the girls, and may even be considered a feminine mode of drawing.

(c) *Human Figure.*

The drawing of a man has traditionally and rightly been considered the most important and revealing standardized drawing situation, not only for estimating intelligence level, but also for personality interpretation. Good-enough's well-known work (13) has shown an objective method for a rough estimating of intelligence, whilst the recent work by Machover (22) has performed a similar service to personality interpretation on the basis of the drawing of the human figure. Preceding and following these manuals of interpretative technique have been a large number of papers which have contributed to particular aspects of the methods.

Apart from the more or less careful execution of the drawings by the two sexes, the most striking feature about the drawings of the human figure is the changing presentation, either in full face (FF) or profile (P). It is a well-known and established fact that girls generally prefer drawing their persons full face (13, p. 61; 25, p. 41; 20, p. 115; 22, p. 93), and the present sample supports these findings completely. Table X indicates that girls chose, with an overwhelming majority, full face for their portrayal of the human figure, whilst the boys distribute their different presentations almost equally.*

* The classification category "profile" in this paper does not necessarily refer to "true profile," e.g. the whole figure shown in profile. All drawings with the head in profile were classified as profile drawings regardless of the remainder of the body.

TABLE X.—*Distribution of Full Face and Profile Drawings.*

	Boys.	Girls.
Both sexes drawn full face . . .	34	64
Both sexes drawn profile . . .	28	3
Own sex drawn full face, opposite sex drawn in profile . . .	8	12
Own sex drawn profile, opposite sex drawn full face . . .	10	1
Total	80	80

Various explanations have been offered for this marked sex difference. It may be that the girl is more familiar with her full-face view by a comparatively more frequent mirror inspection than the boys. Machover suggests that the full face may indicate "a tendency to exhibitionism and display, which in our culture is more characteristic of females" (22, p. 93). The full view, moreover gives opportunity for display of ornament and decoration and for bringing the dress to full effect. Besides this, the influence of drawings in fashion journals, etc, should not be overlooked. It may therefore well be that the emphasis on full-face drawings of women by girls may have less clinical significance than when met in drawings by boys.

The change from full-face drawing to profile has been considered by various investigators as a sign of maturity, of chronologically higher age and of increased intellectual power (13, p. 34; 22, p. 93; 8, p. 321). There are, however, many exceptions to such a general trend. "Most of the drawings made in the immediate pre-adolescent years are profiles. During the first adolescent disturbances there is a tendency to revert to the full-faced drawing of the pre-6½-year age group" (25). There are, moreover, qualitative differences in the profile drawings executed by normal and subnormal children. "While the profile drawings of the subnormal children showed more mature elements, they also contained more immature elements such as absence of trunk, attachment of arms and legs at the neck, a row of buttons to represent clothing, and disproportion of parts. The immature elements more than balanced the mature elements in the total score" (21).

The overwhelming emphasis with which the girls use the full-face presentation makes it doubtful whether the change to profile has any meaning whatsoever in their case. It has generally been assumed that the child introjects himself into the person he or she is drawing, as is seen in the well-known cowboy and gangster stereotypes, and the many clinical signs of shading, reinforcing, erasing, omitting of parts, indicating thereby the draughtsman's tension areas (22). Girls, studying themselves in the mirror and knowing their attractions only as full views, tend naturally to portray themselves, or rather their ideal of themselves, as full view. The full-view trend in the girl population is therefore comparable to the cliché drawing of boys portraying their wish dreams.

Some support for this assumption may be found in the few cases where girls use both types of presentation in their portrayal of human beings. As seen from Table X, a decisive majority of those girls who showed both types of presentation, use full face for depicting their own sex, but change to profile

when drawing the opposite sex. The boys do not show any differentiation in presentation.

Generally speaking, the findings of the present investigation support McCarty's suggestion that the boys probably "represent what they see from the less naïve and intimate viewpoint." Further, it appears that differential treatment in the interpretation of full face and profile should be applied to the drawings of children of different sex. Whilst the boy's drawing of a man or woman may well be indicative of presence or absence of maturity, a similar interpretation is probably not possible for a girl's drawing.

As is to be expected from children who are struggling with the problems of puberty, sex references of an obvious or disguised type are frequent in the drawings. On the other hand, the task of differentiating between man and woman in a drawing is, for many children, difficult because their technique is too primitive or because they inhibit too much. Their drawings either do not differentiate at all between the sexes or purely superficially on the basis of hair-style and skirt. However, shading, type of line, etc., have been regarded as indicators of tension and anxiety (13, 22), and it is therefore often possible to ascertain from these clues whether the "sexual neutrality" is due to emotional disturbances or intellectual inferiority.

Drawings which characterize the sexes by anatomical or cosmetic detail are on a much higher level and may betray a certain degree of emotional security as well as pronounced sex interest, reaching, in extreme cases, pathological forms of utter lack of inhibition (10). Sex is still taboo in the age under discussion here, and the comparatively frequent but not pronounced sex references in the present sample are considered to be indicators of the "freedom of fear" in this particular environment.

It is obvious that the only socially permissible anatomical sex reference is the indication of the bosom and breasts in the female drawing by a suitable curving of the chest-line in the profile, and in the full-face drawing by a trapezoid-shape of the upper part of the body, which suggests the waist and wider shoulder part. Admittedly, the same execution may apply to the modern idea of masculine beauty, but we may safely accept this drawing technique as being reserved for the female sex.

The analysis of the drawings shows that the boys indicate the female sex in 14 cases (39 per cent.) in the profile, and in 5 cases (11 per cent.) in the full-face drawing. The girls, on the other hand, indicate the female sex in 18 (24 per cent.) of their full-face drawings, and have too-little chance to do likewise in their 4 profile drawings of women. In this connection it must be pointed out, however, that far more significance must be attached to the curved profile line, which is an intentional product of the draughtsman conscious of its implications, than to the trapezoid full-face shape which appears to be a stereotype in this girl population.

Another point of sexual attraction which is openly displayed and approved, is the female leg. Despite their frequently primitive drawing technique, the boys of our sample have managed to express their conviction that women's legs are worthy of portrayal. That, at least, is the conclusion one has to arrive at when comparing the boys' drawings with those of the girls, who have the

TABLE XI.—*Feminine Sex References in Drawings.*

	Boys, %	Girls, %	Significance.
Facial features as shown in full-face drawings :			
(a) In women	29·5	32·8	..
(b) In men	7·1	32·1	++++
Bosom :			
(a) In profile	39·0	..	..
(b) In full face	11·0	24·0	..
Legs—Dress :			
(a) Showing only feet and ankles	13·75	52·5	..
(b) Showing more than half the leg	63·75	41·25	++++
(c) Unclassified	22·5	6·25	..

tendency to hide the legs of their women behind particularly long party dresses. Table XI indicates the proportions of two groups, one showing either only the feet or not more than the ankle, the other group showing half or more than half of the legs. The test for statistical significance shows that the differences for the whole sample are highly significant, whilst the breakdown into age groups indicates that this is particularly due to the oldest group of boys, though the two younger groups too, show the same tendency. It must, however, be pointed out that the party dress, too, may be a learned stereotype preferred because it eliminates drawing the legs. It needs more evidence before any conclusions concerning this particular point can be reached.

Other female characteristics, as reported in previous investigations, include long and abundant hair, and emphasis of facial features, particularly cupid-bow lips and detailed eyelashes. The latter "cosmetic characterization" has realistically been used by the boys for 13 drawings of women, whilst 25 girls devoted attention to this feature. But it is also characteristic for the girls that 21 transfer the same "cosmetic characterization" to their drawings of men, whilst only 3 boys did likewise.

Practically no comparable characteristic feature referring to men can be listed. The draughtsmanship of the children is generally too poor to permit anatomical differentiation like broad shoulders to emerge, and other differentiating characteristics like beard, moustache, pipe, cigarette, etc., are infrequently but equally distributed among the sexes.

Considering the difficulty of portraying a "manly man" without introducing crude sexual characteristics, the absence of typical male references cannot be regarded as significant. As far as the portrayal of women is concerned, however, a basically different attitude taken up by the two sexes can be seen which is not explainable merely by reference to different drawing interests. From the drawings it appears that the boys attribute the attractions of the feminine sex to quite different features than do the girls themselves. Whilst the girls consider the external characteristics, cosmetics and beautiful dresses, as the most essential part of their femininity, the boys neglect and overlook this feature consistently, but devote pronounced attention to the erotically stimulating parts of the female anatomy.

SUMMARY.

Various features of four simple drawing subjects (house, tree, man, woman), as executed on drawing paper of limited size (5×8 inches) by educationally subnormal children of both sexes, aged 13 to 15 +, and an average I.Q. of 64, have been compared. Though the two groups were matched for age and intelligence and showed a similar social and educational background, the girls have, nevertheless, been found to differ considerably from the boys in conception and execution of the drawings.

The following conclusions have been reached :

1. If given the choice between a paper position with the longer side parallel to the edge of the table where the child sits and a position where the shorter side of the paper is nearer the child, the girl prefers the first position, regardless of whether it suits the subject of the drawing or not. The boy, however, adapts the position of the drawing paper to the requirements of the subject.

2. There is a clearly-marked tendency on the girls' part to draw generally in smaller size than the boys.

3. A comparison of the sizes of the human figure reveals that sex and age of the draughtsman may influence considerably the drawing. The youngest age group of the sample tended, irrespective of sex, to draw consistently their own sex larger than the opposite sex. The girls of all age groups tend to draw the man smaller than the woman.

4. The girls are poorer draughtsmen than the boys, and spend less time and care on the drawings. However, both sexes spend more work on the elaboration of interesting subjects. Nevertheless, generally speaking, the level of the girls' best drawings does not differ significantly from the level of the boys' most uninspired productions. Throughout the test most boys showed themselves superior in detailing and elaboration of the subjects.

5. The treatment of the window pattern of the house is characteristically different in the two sexes. The girls draw more corner windows than the boys, and tend to draw them smaller. They also frequently omit the fifth window placed at the intersection of the diagonals, which is characteristic for the boys. Instead of this, a marked tendency for transparency can be observed in the girls' drawings, a feature which is absent in the boys' products.

6. Among four types of trees, differentiated in this paper, two have been singled out as being preferred by opposite sexes. The girls like to draw trees with branches "decorated" at the ends by single leaves, whilst the boys draw more often trees which show foliage as well as branches.

7. In the drawings of the human figure, the girls show marked preference for full-face drawings whilst the boys do not show any particular liking. Another tendency in the girls' drawings, unobserved in the boys' work, is their choice of full face for their own sex and profile for the opposite sex.

Summarizing, it can be said that the "average" educationally subnormal girl between 13 and 15 + years and an I.Q. between 58 and 71, of the particular sample discussed, produced a set of drawings with the following characteristics :

All three subjects are drawn on paper with the longer side parallel to the artist. Her house is approximately 2 to 4 inches wide and 2 to 4 inches high.

She tends to draw the woman taller than the man, giving her a size from $2\frac{1}{2}$ to nearly 4 inches, whilst the man, though often attaining the same height as the woman, is just as often made to shrink to 2 inches. She does not spend much care or time on her drawing, using about 4 minutes to finish the house, a little over 5 minutes to finish the drawing of a woman and a little less than 5 minutes to draw the man. The drawing of a woman is more carefully executed than that of the man or the house. She shows very little interest in details, and may often incorporate characteristic features into her drawings. She generally draws, for example, small windows placed in the corners of the house and may add interior features like tables and chairs to the drawing of the exterior of the house (transparency). Her drawings of a tree show very often a typical characteristic decorative feature when isolated leaves are attached to the ends of branches. She draws the human figure nearly always in full-face view, but tends in a few cases to draw the opposite sex in profile. She pays little attention to the commonly accepted sexual characteristics like indications of breasts and display of legs, but concentrates on the elaboration of cosmetical facial features, often transferred to her drawings of a man, and display of "party dresses."

The educationally subnormal boy of this sample of the same chronological age and the same I.Q., shows the following typical characteristics:

He adapts his drawing paper to the requirements of the subject, e.g. making use of the available space to obtain pleasing proportions as well as a chance to draw large. He produces a "big" drawing where the house has a width between $2\frac{1}{2}$ and 5 inches and a height between $2\frac{1}{2}$ and nearly $4\frac{1}{2}$ inches, and a person has a size between $3\frac{1}{2}$ to a little over 6 inches. He does not differentiate in size between the two sexes unless very young. Often considerable time is spent on his drawing, but he usually averages $7\frac{1}{2}$ minutes for the drawing of a house, 7 minutes for the man, and 6 minutes for the woman. His drawing is carefully done with the inclusion of many details. If he draws the windows into the corners of the house he will very often add a fifth window at the intersection of the diagonals. He is not prone to transparency in the drawing of a house. The drawing of a tree tends to show foliage as well as branches. The human figure is drawn by him either in full view or profile, the latter position sometimes showing the bosom in the drawing of the woman. In both types of presentation he likes to show short skirt and legs when depicting a woman.

Various marked deviations in the girls' drawing performance from that of the normal school population, as reported by other investigators, have been mentioned. Our girls draw apparently smaller than the average girl and give also a markedly inferior performance in those qualitative aspects which have been commented upon by others as being the particular field where girls excel. No similar deviations concerning the boys could be recorded.

Without committing ourselves at present to a decision whether the differences in drawings shown by the two groups are "true sex differences," it has been pointed out that these differences may influence considerably the clinical interpretation of drawings, and that it is necessary to view the particular case against the appropriate background of a comparable group. It is clear that

the clinical significance of "signs" will vary tremendously as long as we do not know with some degree of certainty whether the presence of a particular feature is merely due to the sex and the traditional upbringing of the artist, or whether it indicates an emotional reaction to a situation, perhaps particularly brought into sharp relief by the sex of the artist, but not necessarily largely due to it. Other investigations of different populations would assist considerably in clarifying these problems. It appears, however, to the writer that establishing of a typical drawing pattern of the institutionalized educationally subnormal child of both sexes may assist already now in screening out atypical cases and may, once the significance of atypical features has been better understood than at present, contribute to and affirm the clinical diagnosis.

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THE THERAPEUTIC FACTORS OF GROUP-ANALYTICAL TREATMENT.

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Theoretical Considerations.

THE term "therapeutic factor" will be used to denote any agency which is potentially capable of producing such changes in the personality of a patient that an alleviation or cure of clinical symptoms may result. Such agencies originate either in the environment of the patient or in his organism. In psychotherapy we are primarily concerned with environmental agencies, namely those which are introduced, regulated and controlled by the therapist, and which are therapeutic only if the patient responds to them in a manner that is conducive to producing the desired changes in his personality. We can therefore distinguish three elements in a therapeutic process: environmental factors, responses by the patient, and ultimate personality changes.

In individual analytical treatment the technique of the therapist establishes environmental conditions, which, if properly adjusted to the needs and the responsiveness of the patient, will elicit such reactions from him that an ultimate remedial effect is achieved. Alexander (1946), for instance, characterized the therapeutic process thus: "In all forms of aetiological psychotherapy the basic therapeutic principle is the same: to re-expose the patient, under more favourable circumstances, to emotional situations which he could not handle in the past. The patient, in order to be helped, must undergo a corrective emotional experience suitable to repair the traumatic influence of previous experiences."

In group-analytical treatment the principles are essentially the same; but the environment is more complex, its impact on the individual patient more manifold, and the therapist's control over environmental factors less complete.

If we examine the environmental factors to which group patients are exposed, we can distinguish two different social phenomena which may have a dynamic influence on group events. In the first place there are certain environmental factors which impinge collectively on all group patients. In accordance with K. Lewin's field theory (1935) these factors will be called "field forces." Secondly, there are person-to-person interactions among the patients. These phenomena will be called "interpersonal relations." They have been extensively studied by Moreno (1934) and his sociometric school. Thus, the two types of social phenomena noticeable in a group situation

correspond to two basically different forms of methodological approach to the study of group events.

The best known example of field forces in group situations is the attachment towards the same leader by which all group members are activated. Freud (1921) saw the essence of group formation in the establishment of such a relationship between a leader and his followers. A group, he said, consisted of "a number of individuals who have put one and the same individual in the place of their ego-ideal and have, through doing so, identified with each other in their ego." This conception of group formation is, however, too narrow in several respects. F. Redl (1942) has pointed out that groups can form round different types of leaders or "central persons," and that such a central person need not necessarily be the model by which the ego-ideals of group members are shaped. He may be the collective target of libidinal or aggressive drives, or a person who is capable of rendering a special service to the ego of the group members. Similarly, in the group-analytical situation, the common transference to the therapist is not merely based on the collective adoption of the therapist as an ego-ideal, but on the whole gamut of other transference feelings. Redl has also emphasized that the emotions which develop between group members are not merely those which can be characterized as "identifications in their ego." To quote Redl: "It is obvious that the group members, on the basis of that very identification, also do develop new emotions in relationship with each other."

Finally it must be stated that the common transference towards the therapist is not the only field force which is operative in a group-analytical situation. Among other field forces which have been found to be therapeutically active may be listed: the association with neurotic compeers, the size of the group, the sex of the members, the topics of group discussion, and the various group tasks.

The group tasks are of particular dynamic significance, no matter whether they are explicitly stated by the therapist or tacitly assumed by the patients. Group tasks require overt actions from each member: the responses to other field forces may remain more concealed and private.

The group tasks are essentially and fundamentally verbal in character. The patients are expected to keep the group discussion going. This may be called the general verbal task. There are, however, three specific aspects of this general task:

1. The task of candid self-revelation. Every patient is required to reveal his symptoms, problems, ideologies, and opinions to the group. Without it he does not qualify for acceptance as a group member.

2. The task of transforming personal problems into group problems. The patients want to compare and contrast their symptoms, problems and experiences. They are also eager to elicit relevant information from more reticent participants in order to ensure that problems of personal significance should acquire a collective quality.

3. The task of giving interpretations. The patients are encouraged to search for the meaning and significance of neurotic phenomena, and to try to unravel the underlying motivational tangle.

All the patients in a therapeutic group are equally exposed to the impact of the various field forces. Yet their overt reactions to them will vary from person to person. We can regard the behaviour of a person at any particular moment as the resultant of the interaction between two dynamic systems: his personality and his environment. K. Lewin (1935) expressed this interaction by a simple formula which, slightly altered, reads: $R_1 = f_1 (P_1 E)$. In this equation P_1 stands for the psychodynamic organization and immediate responsiveness of a particular patient, R_1 for his overt response, E for the field forces impinging equally on all persons in the group, and f_1 indicates that the interaction between P_1 and E follows along lines which are characteristic for P_1 , but not for any of the other persons in the group.

This formula is, however, inadequate for two reasons. First, it only applies to the response of P_1 at any particular moment of time. If a longer period of time is considered, then one has to take into account that any momentary response R_1 is capable of secondarily modifying both P_1 and E . In other words, there exists a circular reaction, or to use the current fashionable term, a "feedback system." The modification of P_1 in its ultimate form will correspond to the therapeutic result. The modification of E will be noticeable in a structuring of the social field through the establishment of hierarchies, and in the development of group-characteristic traditions, manners, rites, mores, beliefs, etc.

The second reason for finding the formula $R_1 = f_1 (P_1 E)$ not entirely satisfactory concerns the fact that underneath the diversity of overt responses in a group one can discern a common matrix of actuation which is due to a common emotional resonance to field forces. In a crowd this common matrix of actuation might issue in collective overt behaviour, whereas in a therapeutic group the individuality of behaviour is maintained. An example will illustrate this point. The general verbal task activates all group members. As a result, they all experience a desire to take part in the conversation. Yet it is only on rare occasions that the tension in the group becomes so great that everybody speaks at once. Generally the conversation is conducted in an orderly manner without much overlapping or interrupting of speech. The amount of talk contributed to the discussion by the different group members will, in the long run, vary according to their personal characteristics and their ability to comply with the common desire to speak. If it is desired to amend the formula $R_1 = f_1 (P_1 E)$ in order to express the fact that a common matrix of actuation exists in response to any particular field force, one would have to introduce the symbol f , which would apply to all group members indiscriminately, and indicate that the interaction between P_1 and E initially produces reactions which are common to every participant. The formula would then become $R_1 = f_1 [f(P_1 E)]$.

The common matrix of actuation can be used as a criterion to differentiate between the responses of the various group members to a particular field force. If we would merely have regard to the form in which responses manifest themselves, we would be confronted with such a diversity in quality that we could hardly find a common denominator that would allow a quantitative comparison of responses. If we, however, accept as the common denominator

the common matrix of actuation aroused by a particular field force, we can compare the responses of patients according to the degree to which this common actuation manifests itself. For example, patients can be ranked according to the facility with which they can comply with the general verbal task.

There exists also another criterion by which the patients' responses can be quantitatively compared. The general behaviour of a patient in the group is the response to the impact of the total constellation of all the field forces in it. By virtue of the circular reaction which exists between *R* on the one hand and the interacting dynamic systems *P* and *E* on the other, the general response of a patient will tend to modify *E* in a manner characteristic for him. There are two modifications of the social group environment which can be readily observed: the effect a patient's behaviour has on the group proceedings, and the effect it has on the feelings of fellow members.

The degree to which patients influence the group proceedings will determine their dominance in the group. The degree of friendly feelings patients evoke in other members during sessions will determine their group popularity.

Group dominance and group popularity can therefore be used as criteria by which the general group behaviour of patients can be compared. It is possible to align patients both on a scale of group dominance and on a scale of group popularity.

Between these two scales a low and insignificant coefficient of correlation has been found. The mere fact that a patient has a dominant influence on group proceedings does not necessarily assure him a high degree of popularity. In fact, a patient who becomes a scapegoat target of group hostility may be a very influential "central person," but by no means a popular one.

So far we have exclusively examined the effect of field forces on the group members. We shall now have to investigate the second category of social phenomena which we mentioned before, namely the interpersonal relations.

The term interpersonal relations refers to the interaction between two people. If these two people were by themselves and not jointly subject to a particular field force, such as a common task or objective, then the relationship between them would be determined directly by their respective personalities, or at least predominantly so. This type of relationship will be termed "direct" interpersonal relation. If, on the other hand, these two persons are members of a group or are otherwise subject to particular field forces, then the relationship between them will be determined indirectly, or at least predominantly so, by their joint responses to common field influences. This type of relationship will be termed "indirect" interpersonal relation.

This differentiation between direct and indirect interpersonal relations is important and indispensable. The two types of relations have, in general, little in common with each other. It can be shown that direct relations and the feelings they engender tend to be private and concealed in a group, whereas indirect relations tend to manifest themselves openly. This difference is of general validity. Two persons may feel affectionately towards each other as individuals but, when required to perform a joint task—be it the co-operative undertaking of married life or merely a temporary partnership at a game of bridge—their mutual attachment will frequently be masked by field-determined

emotions of a different kind. The same observations can often be made with regard to direct interpersonal feelings of hostility.

The fact that direct interpersonal feelings do not readily manifest themselves in a group setting was also shown by the application of a "sociometric test" which inquired, without reference to any group activity, into feelings of liking and dislike between members. In a previous paper (1950a) the results of such an investigation were reported, and a method outlined by which the tangled criss-cross pattern of direct relationships could be transformed into a rank scale of direct popularity. It was found that the patients were, in general, not aware of the feelings other patients had towards them, and therefore had, in general, no knowledge of their own status on the scale of direct popularity. The rank correlation between the status of direct popularity patients expected to have and the status they actually occupied was $-.23$, which was far from being significant statistically.

There are thus two scales of popularity in a group: the scale of direct popularity which can be obtained by means of a sociometric test, and the scale of group popularity which can be readily estimated by group observation.

To assess the potential therapeutic value of the various group factors which have been outlined, an investigation on two therapeutic groups has been carried out.

The Groups Investigated.

Our data were obtained from two sexually mixed groups of 7 patients each. The male and female patients had, at first, been treated separately in one-sex groups. After 10 and 7 months of treatment respectively the groups were amalgamated. The emotional reactions evoked by this amalgamation have been described elsewhere (1950b). The treatment of the two mixed groups continued for another 9 months. During this time no new patients were introduced, so that the group composition remained unaltered.

The patients suffered from long-standing neurotic illnesses. They were out-patients, and came for treatment twice weekly. The sessions lasted $1\frac{1}{2}$ hours. The therapeutic approach was "group-analytical" in the manner described by Foulkes (1948). Shorthand notes of the discussion and other group events were taken by the author during the sessions.

One month after the termination of treatment the members were asked to complete a questionnaire. This was couched in fairly general terms.

One series of questions referred to therapeutic results, and the manner in which different symptoms had altered during treatment. The patients were encouraged to give specific examples and to avoid general statements. They were also asked to say whether their social relations had changed, and whether people had made spontaneous remarks concerning a change in the behaviour of the patients.

Another series of questions tried to elicit the patients' opinion of group treatment. Which aspects of treatment had been most helpful or most disturbing? What criticisms and suggestions concerning treatment did they have to offer? Had treatment helped them to gain a better understanding of themselves? What was their opinion of interpretations?

Other questions dealt with their feelings and opinions concerning fellow members. Were they still in touch with any of them? Whom had they liked or disliked? Whom had they considered helpful or unhelpful? Would they have liked to exclude any members?

These questions were interspersed with requests to give specific examples and explanations.

All patients responded by sending detailed replies. These replies and the record of the group discussions form the basis of this investigation.

Therapeutic Results.

There are no valid or generally accepted criteria by which therapeutic results can be assessed. It was therefore decided to rely arbitrarily on two criteria: (a) subjective and objective improvements in social relationships, and (b) the patients' own detailed assessments of clinical improvement.

Improvement of social relationships.—The patients were asked to report whether there had been any change in their attitudes and feelings to members of their family, to friends, colleagues, casual acquaintances or strangers, and whether other people had spontaneously remarked on such a change in them.

Ten of the 14 patients reported that they had improved socially. They found it easier to talk to people, and to be friendly and companionable. Four were able to add that this improvement had been corroborated spontaneously by other people. One patient who was otherwise dissatisfied with his therapeutic result stated that it was not surprising that group treatment could produce some social improvement, as it "tends to skim away one's expressly social symptoms" through enabling one to rehearse a neurotically disturbed social role before a sympathetic audience.

Clinical improvement.—The patients were asked to describe in detail the nature and intensity of their symptoms before and after treatment. From their accounts it was evident that 8 patients were satisfied with their clinical improvement and 6 patients were not.

Scale of therapeutic results.—The two criteria of improvement are not sufficiently exact to allow a quantitative estimate of the degree of improvement shown by each patient, or to allow a detailed ranking of the individual patients according to differences of clinical improvement. But an approximate subdivision of the patients into three categories was possible (see Table I): (1)

TABLE I.

	Patients.													
	♀ A.	♀ B.	♀ C.	♀ D.	♂ E.	♂ F.	♂ G.	♀ H.	♀ I.	♂ J.	♂ K.	♀ L.	♂ M.	♂ N.
Therapeutic results	++	++	++	++	++	++	++	+	+	+	+	—	—	—
Phobic symptoms	—	—	—	—	—	—	—	—	+	+	+	+	+	—
Intimate identifications	+	+	+	+	—	+	+	+	—	—	—	+	—	—
Greatest group disturbance: Sexual discussions	+	+	+	+	+	+	—	+	+	—	—	—	—	—
Effect popularity (in rank order)		1	4	11	14	2	3	13	8	8	5	6	8	10
Group popularity	+	+	+	—	+	+	+	+	—	—	—	—	—	—
Dominance	—	+	+	+	+	—	+	+	—	+	—	—	—	+

“ Good ” results—patients who were socially improved and also satisfied with the alleviation of their neurotic symptom. (2) “ Fair ” results—patients who only admitted improvement on one of these scores. (3) “ Poor ” results—patients who were neither socially improved nor satisfied with the result of treatment.

“ Good ” results : There were 7 patients in this category. Patients A, B, C, and D were female, the other three male. A brief history of Mrs. A will serve as an illustration of a “ good ” result.

The leading symptoms of Mrs. A had been panic attacks in the street, especially in crowds, and when travelling on buses or trains. For years she had only been able to leave her home in the company of either her husband or mother. She had been irritated by housework and the care of her infant son. Sexual relations had become abhorrent to her. At the end of treatment she could “ travel quite happily on buses, trams and cars.” She even went on a holiday to France and enjoyed it. She no longer “ bore a grudge ” against her son, sex life had become “ normal,” and she could do housework “ quite happily, though sketchily.” Her “ relationship with people had altered considerably for the better,” and this was spontaneously remarked on by husband, mother and a female friend.

“ Fair ” results : There were 4 patients in this category, patients H and I being female. Patient H reported an improvement in her clinical condition, but no change socially ; the other three patients were improved socially, but dissatisfied with the treatment result. The history of Mr. K is presented as an example.

Mr. K had been unable, for 13 years, to do any work when he was, or felt, observed. His work record had deteriorated, and when treatment started he was in casual employment as an unskilled worker. Even at home he would rather go hungry than pour himself out a cup of tea or cut off a slice of bread if another person was in the same room to observe him. At the end of treatment he was in regular and skilled employment, was happily married and the proud father of a baby girl. Yet he was not satisfied with the result of group treatment as he was still left with a number of unpleasant symptoms. He said : “ I do not think embarrassment whilst under observation is so acute now. I try to concentrate on what I am doing and to shut people out. But I think this old symptom has been ousted by a new one which is more troublesome.” The new symptom was a fear of being considered “ illiterate ” by other people. He had become more sociable, but had “ occasional lapses.”

“ Poor ” results : Three patients were in this category and only patient L was female. Mr. N’s history will be quoted because he seems to have had the worst therapeutic result.

Mr. N was a schizoid, gawky and emotionally inhibited person. He had left his parents as soon as he was financially independent, and had, since then, led a lonely and friendless existence. He had found some compensation in daydreams of ambition and achievement, and in occasional short-lived affairs with casual female acquaintances, which started with sexual bravado and ended in masturbation fantasies. He was engaged in industrial research

work, but was unable to complete any investigation, however simple. In the course of group treatment he lost his research job, and was then employed in routine tasks, which he could perform quite satisfactorily. He remarked: "I am not quite sure that a psychological change is responsible for this slight improvement. It could be that the job is easier than the last one." At the end of treatment his relations with people were "somewhat worse," as he had become more self-conscious, more handicapped by a slight stammer, and more aware of his shortcomings. He was, however, not discouraged by this failure, and is at present attending a therapeutic group elsewhere.

The Therapeutic Effect of Field Forces.

In trying to assess the therapeutic effects of field forces we are hampered by the limitations of our present investigation. A reliable assessment would require an experimental approach such as, for instance, the observation of two comparable groups, of which one is subject to a particular field force and the other not. It is, however, not feasible to test every type of field force, which is operative in a therapeutic group setting, in this experimental manner.

In this investigation the therapeutic potency of field forces has been judged in the following ways: In the first place, each field force was considered separately, and the varying responses of the group members compared. As has been pointed out in the theoretical introduction, each field force aroused a common matrix of actuation from which the individual diversity of manifest responses springs. The immediate effect of each field force was reflected in the group scale indicating the degree of overt expression which the common matrix of actuation caused by a field force attained. This group scale could be correlated with the scale of therapeutic results, and this correlation used as an indicator of the differential therapeutic potency of a field force.

Similar considerations were applied to the total constellation of field forces in the group setting. The scales which reflected the immediate and joint effect of all field forces were the scales of group dominance and group popularity. The correlation between these scales and the scale of therapeutic results furnished a measure of the differential therapeutic potency of the total constellation of field forces.

It must, however, be pointed out that this measurement of therapeutic results is only a differential one, which compares the different degrees of improvement attained by the various patients but does not allow a comparison of the clinical condition of the group generally before and after treatment. Thus it can only serve as a standard of comparison for those field forces which have a markedly differential effect on the patients. The assessment of the therapeutic value of those field forces which have a more uniform effect on the group has had to be based on general considerations, and on the patients' opinions that these field forces are therapeutically indispensable.

In the following paragraphs only those field forces will be considered which appeared to be therapeutic factors.

In calculating the correlations between the various scales the rank correlation coefficient τ of Kendall (1948) has been employed throughout.

The general verbal task.—This is the most constant and fundamental demand that group members have to meet. Some patients will respond to it with great eagerness and an undue amount of talk. In most patients it will appear that their desire to speak is, for the most part, regulated by the opportunities and requirements of the group situation. There will also be some patients in whom the prospect of having to speak in front of the group will arouse anxiety and apprehension.

Such patients with a neurotically anxious response to the general verbal task will, for the sake of a succinct description, be termed laliophobic patients.

There were 5 such patients in the 2 groups (see Table I). They could only contribute to the discussion by fighting against their laliophobic disturbance.

One of these laliophobic patients, Mr. M, gave the following description of his response to the general verbal task: "In the group I suffered from my usual symptom, which appears when I am in the company of more than one person and am not absolutely sure of my complete intellectual superiority and their recognition of it. Thus I was almost always unable to take part in the discussion." This description reveals some of the roots of the laliophobic symptom, namely a narcissistic over-concern with verbal productions, and an aspiration to a level of linguistic excellence and intellectual competence which would assure general acclamation.

Mr. K made these remarks concerning his laliophobia: "The few occasions when I held the floor I experienced relief afterwards, a feeling of elation. But when questions were put to me and I could not speak, I had a feeling of frustration, a feeling that I had fallen down and not done all I should have done. I think these occasions have been more harmful than helpful."

The presence of laliophobic symptoms does, however, not necessarily preclude a patient from joining effectively in the group discussion. Mr. J, for instance, gained a fairly dominant status in the group. He could speak at length, once his initial trepidation had been overcome, and particularly when he could be aggressive and derogatory.

The rank correlation between laliophobic symptoms and the scale of therapeutic results is -0.65 , which is significant at the 4 per cent. level. This finding indicates that a phobic difficulty in discharging the general verbal task tends to be a prognostically unfavourable sign for group-analytical psychotherapy. It is in agreement with this finding that 4 of the 5 laliophobic patients volunteered the opinion that they should have been excluded from the group because they felt they had been unable to co-operate adequately. It was not that they had derived no benefit from the treatment, but that, whatever improvement they had achieved, had been bought at an inordinate emotional expense.

The task of candid self-revelation.—This is an obligation which does not stir the group as continuously as the general verbal task. To expose one's intimate and guilt-charged problems to the forum of the group caused anxiety and embarrassment in every patient. The laliophobic patients were not different from the other group members in this respect; one even gained the impression that they sometimes welcomed an opportunity to perform this task, which was generally recognized as difficult and anxiety-provoking.

The task of candid self-revelation was regarded by the group members as an indispensable group performance which they expected—or, if necessary, exacted—from everybody. This was strikingly illustrated by an incident that occurred when the male and female groups had been amalgamated. For about 4 weeks the members guardedly avoided frank self-revelation apart from the recital of relatively harmless symptoms. Yet there was a mounting tension and dissatisfaction in the two amalgamated groups. Eventually the patients decided that, in order to re-establish the therapeutic atmosphere to which they had become accustomed in the one-sex groups, they had to be frank about those personal data of which they felt ashamed. The author did not encourage this plan, but the patients disregarded him and carried out their decision. In turn they performed the initiation ceremony of confessing embarrassing symptoms and problems, and the result proved beneficial.

The task of candid self-revelation may therefore be regarded as having a general and fairly uniform therapeutic effect.

The task of transforming personal problems into group problems.—This task is closely associated with the preceding one, as the knowledge that the group will attempt to deal collectively with personal problems facilitated candid self-revelation. Mrs. B expressed this by saying: "There was the initial effort of making confessions of things I was ashamed of. But I knew they would be seen in their right perspective by you and treated as problems by the rest of the group—not as horrible aspects of my character."

The feelings which accompanied this task were obviously those of a positive identification with the group. These feelings and their therapeutic effect will be considered presently in connection with the field force of associating with neurotic compeers.

The giving and receiving of interpretations.—The task of giving interpretations divided the group in a similar way as the general verbal task. The laliophobic patients disliked stating their opinions of the meaning and psychogenesis of symptoms, dreams or peculiarities of behaviour. They were therefore inclined to regard the giving of interpretations as an unhelpful group task. Mr. M, for instance, felt that his views might have been considered "stupid or unimaginative," and he had therefore avoided taking part in interpretative discussions.

Some patients remarked shrewdly that giving interpretations did not only throw light on the mind of the interpreted person, but also revealed the mind of the interpreter.

With regard to the receiving of interpretations the group was almost unanimous. All the patients, with the sole exception of Mrs. I, stated that they had been helped by interpretations given to them. They had, they said, learned to understand themselves better. Several patients added that this self-knowledge had aided them in analysing their own feelings, and had enabled them to cope more adequately with personal difficulties.

Yet this universal acceptance of interpretations was a limited one, and hedged in by reservations concerning their validity in their own personal case. Here are some characteristic remarks. Mr. F: "I found the interpretations given to other people easier to accept, especially in Mr. E's case. In fact,

I used to get half-annoyed with him because he could not see the point. It seemed so obvious to me that what we had worked out was correct." Mr. M: "It is quite puzzling, but it seems to me that interpretations are quite reasonable in theory, but when it comes to accepting them and to applying them to myself, then they are ridiculous."

Several patients remarked that it was not the intellectual aspect of interpretations which was of therapeutic importance, but the emotional effects produced by them. To quote Mr. F again: "Whether interpretations were true or not, they set people thinking and created emotional disturbances in the right direction." Mrs. A was even more outspoken: "These emotional upsets stamped on the mind more definitely than any amount of mere talking would have done the main causes of your symptoms." Mrs. B analysed her reactions to interpretations in a most revealing manner: "It seems to me that one raises a wall against an interpretation immediately, but it gradually comes true to one. I can remember the feeling when something became real to me, but I think it was such a gradual process that often the realization was not entirely due to the interpretation. Some of my relationships with people have clarified themselves though they had never been interpreted and without any conscious realization on my part."

From these examples one can infer that the receiving of interpretations has a fairly uniform therapeutic effect.

Transference to the therapist.—The therapeutic importance of transference reactions needs no emphasis. It must, however, be pointed out that there is a difference between the transference to the therapist in individual and in group treatment. Whereas in individual treatment all essential therapeutic processes operate within and through the emotional relation between doctor and patient, the sphere of therapeutic activity in group treatment is a wider one because the interactions among the patients absorb some of the feelings which, in individual treatment, may be entirely focused on the therapist. The transference to the group therapist is therefore not of the same exclusive therapeutic significance.

The therapist has, of course, a unique position within the group. He has not joined the group in order to be treated, and he is not subject to the group task of candid self-revelation. In fact, the patients would regard it as a disturbance were the therapist to intrude his personal problems on the group; this does not mean, however, that the patients do not welcome the therapist's occasional admission of human frailties and foibles. In general, the patients want to look up to the therapist as a person of prestige, responsibility and superior knowledge. He therefore holds potentially the most dominant status in the group, and is frequently obliged to counter the patients' attempts to see in him an oracle of wisdom, a beneficent and magical healer, and an authoritative arbiter in all disputes and controversies.

Transference feelings are composed of positive and negative elements. Positive elements will link the patient to the therapist either through a bond of affection and admiration, or through a sparring contest which allows the release and correction of aggressive feelings; negative elements will tend to sever the association with the therapist by the patient's repudiation of him and

his treatment. No therapeutic effect is likely in individual treatment when negative elements gain and maintain the upper hand. The same is, generally speaking, true of group treatment.

Yet there was one exception among the patients investigated here. In this patient negative feelings towards the therapist predominated during the later months of group treatment. He began to repudiate the therapist, but did not relinquish his attachment to the group, in spite of the fact that he was not too kindly treated by the other members. This is an observation which is obviously rare, and which does not seem to have been mentioned in the literature before.

The exception was Mr. N, whose case-history has been briefly outlined already. His predominantly negative transference feelings were revealed by disparaging remarks about the therapist which he made privately, and which had a more spiteful sting in them than similarly critical remarks made by other patients. Mr. N was very unpopular in the group, and he was frequently the butt of hostile and derogatory remarks. Yet, not only did he not leave the group, but he advocated daily group meetings, and suggested that the presence of the therapist would not be required in them. He was the only patient who approached the author, after the group had been disbanded, with a request for further group treatment.

What, then, was the particular attraction that group treatment had for him, and why did he not leave the group as most patients would have done under similar circumstances? There seem to have been two reasons. He was a lonely, friendless person to whom the group offered the unaccustomed experience of being an active participant in a sociable gathering. But he also derived a less salubrious gratification from the group. Under the guise of being helpful he frequently took the lead in eliciting embarrassing experiences from others. The pose of helpfulness hardly concealed his egocentric desire to exploit the group situation in the service of scopophilic tendencies.

Apart from Mr. N the transference to the therapist was predominantly positive in the two groups described. This transference was the strongest group-cohesive influence among the members. When treatment ceased there were a few desultory meetings between some members, and then the social bond that had held the group together disappeared.

Negative transference feelings were, of course, not absent during treatment, but they never outweighed positive emotions towards the therapist. There had been only one occasion in the history of the two groups when the collective transference of the group members threatened to become predominantly critical and negative. This happened at the time of the amalgamation of the male and female group. Yet this transference hostility was subdued by the fear of losing the therapist's support at a time of insecurity and apprehension. It found expression, however, in an indirect manner. The most dominant member in either group was substituted for the therapist as a target for aggression. At that time there was a revolt against the influence of the leading patients, but this revolt was as short-lived as the excessive animosity against the therapist.

The questionnaire contained a request to criticize the author's handling of

the groups. There was only one major complaint which was voiced by 9 patients irrespective of their degree of therapeutic response. They complained that the author should have been more active in leading the group discussions, in giving interpretations, and in offering practical advice. They were, however, aware that this desire for dependence on the therapist ran counter to the latter's policy of encouraging self-reliance and group initiative.

The transference to the therapist influenced indirectly the interpersonal relations among the patients. The most obvious effect of this kind, apart from identifications, were feelings of jealousy and rivalry for the therapist's affection and esteem. Six patients, irrespective of their degree of therapeutic response, stated that they had at times been convinced that the therapist had deliberately favoured others, or had failed to defend them when they were attacked. They knew also that these feelings had been common to all members, as this transference effect had been a recurrent theme in group discussions. This transference-determined jealousy had been most prominent in Miss D, who frankly acknowledged, "I did not want to share you with others." Her feelings towards the therapist, which were often too conspicuous during group sessions, were one of the reasons for her unpopularity.

Another transference effect which caused unpopularity was a desire to emulate the therapist's group role. Miss C and Mr. N were most active in this respect. They were both frequently criticized for wanting to "run the group" to suit their own purposes rather than the benefit of all.

Among the many interpersonal relationships that exist in a group the transference relation to the therapist stands out as a unique influence on all and every group activity. It is also so complex and many-sided that it cannot be considered as a single therapeutic factor, but must be viewed as a concatenation of multifarious factors, some of which may have a general, others a differentiating therapeutic effect, and others may even give rise to responses which hamper therapeutic progress.

Association with neurotic compeers.—Eight of the 14 patients (see Table I) mentioned in their replies to the questionnaire that it had helped them to realize that their neurotic difficulties were shared by others, that they were not unique misfits in a society of apparently normal people. It was somewhat surprising that these feelings were not voiced by all the patients, because all of them had, in the beginning of treatment, reported a feeling of relief when other patients had admitted to have symptoms in common with them which previously had been guiltily concealed. As one patient had put it: "It was rather a relief to know that other people felt the same as you, and that it was nothing to be ashamed of."

It is obvious that the association with neurotic compeers under the conditions of group treatment favoured the emergence of feelings of identification. It was, however, evident from the observation of the groups that these feelings of identifications were ambivalent. Sometimes identifications were welcomed, at other times rejected. "I saw too much of myself in them," said one group member, "and I disliked what I saw." Thus the identifications with the group contained positive and negative elements.

We may assume that in the 8 patients who had emphasized the helpfulness

of associating with other neurotic persons, the positive elements of identification had predominated, at least temporarily as long as treatment was in progress. If we correlate the scale of these positive identifications with the scale of therapeutic results we obtain a r of $+.52$, which is, however, not fully significant statistically ($P = .11$).

This low statistical significance may be mainly due to the small number of patients and the rather crude method of ranking. Theoretically, it is likely that positive identifications with the group contribute to the final therapeutic outcome, but this contribution is certainly counterbalanced by desires to be different from the other group patients, and to identify with persons who are considered normal.

Topics of group discussion.—The emotions which stir the group find expression in the topics which are discussed. At the same time these topics evoke an emotional resonance even in those patients who did not participate in the conversation. These patients respond like an audience whose emotions are excited by the impersonation of actors on a stage.

Eight members mentioned that group discussions which dealt with sexual matters had been most disturbing to them (see Table I). Half of them added that these disturbances had been ultimately helpful. Indeed, when the correlation between disturbance by sexual topics and the scale of therapeutic results was calculated a significant coefficient of $+.63$ ($P = .04$) was obtained.

During the sessions one had gained the impression that all members had been anxious and tense when delicate sexual matters had been considered. This impression is not contradicted by the above finding, if the meaning of the positive correlation is considered as indicating that those patients whose improvement was less satisfactory had been most intensely disturbed by other group events than sexual discussion.

There is some support for this interpretation of the above correlation. Laliophobic patients, according to their own evidence, were most intensely disturbed by the obligations of the general verbal task. It may therefore be a revealing fact that only one of the laliophobic patients mentioned sexual discussions as disturbing. The correlation between laliophobic symptoms and disturbance by sexual discussions was, however, only $-.56$, which was not high enough for statistical significance.

The group discussions on sex were, of course, controlled and guided by the therapist, so that the emotional tension they produced should remain within the limits of tolerance of the most sensitive group member. Regulated in this manner, the emotional resonance which accompanied sexual discussions became a "corrective emotional experience" in the sense in which this term is used by Alexander (1946). At the same time, because these emotional experiences were engendered by the spectacle of group events, one might term them "cathartic" experiences, using the term "catharsis" in its Aristotelian sense.

Topics of aggression were not listed by the group members among the most disturbing group events. Aggressive and sarcastic comments did, of course, occur and, at times, the group temper had been rather critical and hostile. Yet only Mr. N had been a consistent target for group aggression,

and he was the only one who mentioned that the criticism of the group had disturbed him. The patients never had the same difficulty in revealing aggressive symptoms, desires and fears as they had with regard to sexual phenomena. The mere discussion of aggressiveness never raised the emotional atmosphere to the same pitch as sexual topics did.

The sexual composition of the group.—Groups composed of members of one sex only activate an undercurrent of homosexual motivations, which need not, however, be too obvious under normal circumstances. In groups containing both sexes there is similarly a heterosexual stimulation. Both these facts might be inferred theoretically from our preceding findings that sexual topics of discussion have intense emotional repercussions. Whatever the content of the sexual discussions, the presence of the same or the opposite sex in the group will tend to evoke, among other emotions, homo- or hetero-sexual responses respectively. Such responses were clearly revealed at the time when the two one-sex groups were amalgamated. The author has described these responses in detail elsewhere (1950b).

It is likely that these group-conditioned homo- and hetero-sexual responses are of potential therapeutic value, but their effect in this respect will depend on individual characteristics. One half of the patients did not express any preference for either one-sex or two-sex groups. Mr. E, F and G considered that the mixed groups had been more helpful, but Miss D, Mrs. I and Mr. J and M were of the opposite opinion. The two male patients with overt homo-sexual leanings, Mr. G and M, had responded differently to the group amalgamation. Mr. G formed easy friendships with the female patients, whereas Mr. M became distressed in the presence of women and his laliophobia increased.

Size of groups.—It is generally considered that the optimum size of groups for the purpose of group-analytical psychotherapy lies between 6 and 9 members. As this number of participants is, however, too disturbing for some laliophobic patients, it might be advisable to treat such patients, at least initially, in groups containing 2 or 3 patients only.

Popularity.

Direct popularity.—The rank scale of direct popularity (see Table I) was drawn up from the replies to the questionnaire, and after equalizing individual differences in the degree of professed friendliness. The method employed for this purpose was described elsewhere (1950a).

It will be seen that among the patients with "good" therapeutic results were four who occupied the first 4 ranks and three whose ranks were very low. The rank correlation between this scale of direct popularity and the scale of therapeutic results was $+0.26$, which was not significant.

It may therefore be concluded that the degree of direct popularity has no therapeutic effect. This conclusion is in agreement with previous findings that the patients are, in general, unaware of the friendly feelings they evoke in direct interpersonal relationships irrespective of the group situation.

Group popularity.—This scale of popularity (see Table I) was derived from the manifest degree of friendly feelings a patient received during group sessions.

It was not difficult to draw up this scale from the observation of the group behaviour of patients and the record of group proceedings.

Let us, for example, consider the three patients with "good" therapeutic results but low status of direct popularity. Two of them would have been very surprised, and justifiably so, if they had been told that they were disliked by most of the other patients. Miss C could have offered plenty of evidence in favour of her popularity in the group. She had formed a fairly close friendship with two members which continued for several weeks after the termination of treatment, and two other members of her mixed group were friendly disposed towards her during the sessions. Thus she could have claimed that 4 of the 6 fellow patients in her group liked her. She would have admitted that she had often been rather critical and aggressive in the course of treatment, but it had been one of the beneficial experiences of group treatment for her that "criticism need not destroy friendship." Mr. G had also been accepted as a pleasant and well-mannered person by the 4 female members of his mixed group, and he had sometimes met them privately in between group sessions and even afterwards. It was only the third patient, Miss D, who would have acknowledged her unpopularity as deserved. She stated truthfully that she had often gone out of her way to upset and annoy others.

These examples show that direct popularity and group popularity need not go together: the correlation between them was only $+ \cdot 32$, and therefore too low to be significant.

The correlation between group popularity and the scale of therapeutic results was $+ \cdot 70$, which was significant at the 2 per cent. level. The manifest group popularity, therefore, plays an important part among the therapeutic group factors.

Dominance.

The scale of dominance (see Table I) was derived from the frequency with which members contributed to the group discussions and the extent to which they influenced the conversation. Dominance is a conspicuous group factor which can be readily discerned by any group observer, and which allowed the patients little room for self-deception concerning their own status. Patients whose desire for dominance surpassed their actual group influence were, in general, painfully aware of the discrepancy between their aspirations and their actual performance.

There was no significant correlation between dominance and either of the two scales of popularity.

The correlation between dominance and therapeutic results was equally insignificant; it was only $+ \cdot 30$.

DISCUSSION.

In individual psychoanalysis three therapeutic factors may be distinguished: (1) the task of free association (the "basic rule"), (2) the emotional interplay between analyst and patient (the transference + counter-transference relationship), and (3) the intellectual relationship in which the analyst, by means of adequate and suitably timed interpretations + explanations, attempts to

guide the patient towards "psychological insight" (the psychoanalysis in a narrow sense).

In group therapy these three therapeutic factors are modified, and there are, in addition, therapeutic factors specific to the group situation.

The basic rule of free association is similar to, though not identical with, the general verbal task of group therapy. As far as the author is aware there have been no investigations in psychoanalytical literature of the effect on the therapeutic outcome which a neurotic inability to comply with the basic rule has. Some indirect light is perhaps thrown on this question by an investigation into analytical technique. This was carried out by Glover (1940), who sent a questionnaire to 29 members of the British Psychoanalytical Society and received replies from 24 of them. One of Glover's questions was, "What is your method of dealing with patients who need constant encouragement to talk?" The answers he received were "rather indefinite," but Glover remarked that "the persistent silences of some patients are a common source of trouble," and that "this type of resistance appears specially liable to rouse anxiety in the analyst." This suggests the possibility that a patient's inability to comply with the basic rule may retard or even frustrate individual analytical treatment.

In a therapeutic group the neurotic inability of some patients to comply readily with the general verbal task is a very conspicuous group feature. It is therefore surprising that group therapists have said little or nothing about this phenomenon. Foulkes (1948) and Bion (1948) have mentioned silences of the whole group, and have considered their significance and methods of dealing with them. Foulkes has also given an incidental example (supplied by de Maré) of a group patient who had not taken an active part in the discussion because he felt less educated than the other members—a reason for reticence which some of the laliophobic patients in our groups also advanced.

One explanation for the fact that such a conspicuous group feature as laliophobia has been so consistently ignored may be the dislike of group therapists to retain disturbing and troublesome patients in the group. Laliophobic patients are difficult group members because they find group treatment uncongenial and distressing. They tend to be critical, and they either leave the group prematurely or are encouraged to do so. Foulkes, for instance, who gives detailed advice about group technique, suggests that the therapist should take rather a sharp line with people who have doubts about the efficacy of treatment, as it would not be a loss to the group if some patients dropped out and were replaced by more co-operative ones.

This suggestion was not followed in the present investigation, because it was intended to keep the group membership constant in order to be able to study interpersonal relations and group hierarchies. A changing group population would have defeated this aim. Special efforts were therefore made to keep all patients in the group. Two of the laliophobic patients, for instance, were given individual treatment concurrently with group therapy to prevent them leaving the group. They were almost as reticent in individual sessions as in the group environment, but they preferred individual treatment as it caused them less anxiety.

Laliophobia is, of course, not a clinical entity. The dichotomy of the group patients into those who tended to speak freely and those who could only speak with anxiety is to some extent an artificial one. A graduated scale of speech anxiety would have been preferable if it had been possible to measure speech anxiety more adequately. The patients who have been labelled laliophobic suffered from this symptom not only in the therapeutic group, but also in most other social situations in which they were confronted by a number of comparative strangers.

Laliophobia may be regarded as a particular instance of a more general category of allied symptoms which all have their root in, what may be called, an exhibitionistic fear, i.e. a fear produced by performing certain activities before spectators. In this sense laliophobia is related to stage fright, examination fears, erythrophobia, shyness, paranoid fears, etc. Laliophobia acquires its particular importance in group therapy because the general verbal task obliges every group patient to speak in front of an audience.

Patients who suffer from exhibitionistic fears which do not, however, involve speech anxieties are not unduly disturbed by the group tasks. One patient whose exhibitionistic fear was almost exclusively concerned with the activity of writing, suffered no neurotic handicap through performing the usual group tasks, but became distressed when he was asked to fill in a questionnaire during sessions, or had to use his hands conspicuously when offering a light to anybody in the group. Another patient with severe erythrophobia attained a high status of dominance and group popularity because he was not self-conscious when he could speak and keep the group discussion going. Even patients with a slight stammer were not necessarily handicapped by laliophobia; some of them spoke a great deal and with obvious pleasure, but they generally irritated the group because they tended to be repetitive and to use circumlocutions to avoid the pronunciation of difficult words. Thus, if it were possible to change the group task into a non-verbal one, laliophobia might lose its particular significance for group treatment.

In individual treatment the transference relationship between therapist and patient is the most potent therapeutic force. Its influence transcends the treatment sessions and extends into the interpersonal experiences of the patient's life. In Alexander's (1946) opinion the analyst should take note of these secondary transference effects and guide them because "the therapeutic achievements result in part from these life experiences." In group therapy these secondary transference effects need not necessarily transcend the group situation, as the patients find an immediate outlet for them in the emotional interactions with the other patients. Some of the therapeutic achievements result therefore from transference-determined experiences with other group members. But not all interpersonal group experiences are determined, directly or indirectly, by the transference to the therapist; some of them exert their influence independent from transference effects. Transference is thus a less exclusive therapeutic force in group than in individual treatment.

The intellectual relationship between doctor and patient is sometimes credited with a greater therapeutic efficacy than it actually possesses. Interpretations as such do not produce psychological insight, nor is the acquisition

of psychological insight a purely, or even mainly, intellectual phenomenon. Alexander (1946) has emphasized that this form of therapeutically beneficial insight is the result of preceding emotional experiences rather than the effect of an intellectual communication. Mrs. B's account of her group experiences supports this view. She said: "I can remember the feeling when something became real to me, but I think it was such a gradual process that often the realization was not entirely due to the interpretation."

Interpretations given by the analyst arise out of the transference situation and have a personal significance for the patient; they therefore evoke chiefly and primarily an emotional response from the patient. It would, however, be untrue to say that interpretations have no helpful intellectual effect at all. The patients often attempt to view an interpretation in an objective manner as though it did not concern them personally. It frequently happens that a patient will accept an interpretation intellectually, but without the conviction which comes from an emotional experience.

This distinction between the intellectual and emotional aspects of interpretations is very obvious in therapeutic groups. Interpretations given to fellow members can be viewed in a detached manner and judged by their logical consistency or plausibility. From group observation one gains the impression that this intellectual exercise has some therapeutic value of its own. It has the comforting effect of providing an intellectual scheme which seems to bring order and understanding into phenomena that had appeared to the patients to be beyond the range of reason and familiarity.

The therapeutic significance of interpretations is thus very complex. Interpretations coming from the therapist have a different group influence than those which the patients themselves suggested. The former have a prestige component and are inevitably bound up with transference feelings; the latter may have a more poignant significance, however, at times, as the patient who suggests an interpretation to another member is an equal to whom the same interpretation might apply with equal force and validity. Furthermore, the giving of interpretations has to be distinguished from the consideration of interpretations given to the group. The giving of interpretations is part of the general verbal task, and was differential in its therapeutic results. The consideration of interpretations, on the other hand, appeared to be more uniform in its therapeutic effects; emotionally these effects were linked with transference and interpersonal feelings which provided an emotional support to all group members; intellectually they furnished a frame of reference which was of some general help in combating the patients' anxious speculations about the nature of the illogical and repudiated forces which assailed them.

This complex therapeutic significance is not a characteristic of interpretations only. The same is true of other therapeutic factors, such as the transference factor and the general verbal task. With regard to the general verbal task some specific elements could be singled out and examined, as far as possible, in isolation. It was found that the specific tasks of giving interpretations and of transforming personal problems into group problems put laliophobic patients under a disadvantage. These specific tasks therefore were, like the general verbal task, differential in their therapeutic effects. It was otherwise

with the specific task of candid self-revelation ; this did not handicap laliophobic patients more than other group members, and, consequently, appeared to be a more uniform therapeutic factor.

Other field forces with differential therapeutic effects were : the association with neurotic compeers, the sexual topics of group discussion, and the size of the group. These three field forces had an unfavourable influence on the therapeutic progress of laliophobic patients, who were not so much disturbed by sexual topics as by the fear of talking, who would have preferred a smaller group, and who could not form strong positive identifications with their neurotic compeers in the group.

Identifications with the group are of a complex and ambivalent character in all group patients. Positive identifications are due to the common transference towards the therapist, to the task of transforming personal problems into group problems, and to the fellow feelings engendered by the association with neurotic compeers. Negative identifications derive from a desire to be different from neurotics, to be cured so that they could join the larger community of normal people, and from a fear of being rejected. The last-mentioned cause was chiefly responsible for the attitude of laliophobic patients towards the group. They were dissatisfied with their own group performance, and imagined that others felt just as critical and would have liked to exclude them from the group. By disparaging the group members and by repudiating feelings of identification with them, they tried to alleviate the hurtful effect of the imagined rejection by the group.

If one views a therapeutic group as a miniature model of a larger community, these patients with inadequate feelings of unity with the group and its aims would correspond to a proletariat, according to Toynbee's (1946) definition that a proletariat is that social section which is 'in' but not 'of' any given society. The dissatisfied laliophobic proletariat in the two groups described had the effect of reducing group cohesion and of increasing the aggressive temper of the discussions because these patients were critical, suspicious and rebellious. They longed to defy irksome group conventions and to replace them by turbulent interactions. This, for instance, was the ideal of a therapeutic group for one of the laliophobic patients (Mr. J) : "A quickfire discourse is required. Tempers should be frayed, voices raised, blasphemy should be the order of the day ; above all, the therapist must forever be prompting and probing, making interpretations, however incorrect, constantly and importunately. Members must expect to be upset. Every time a patient is able to leave the group in such a state of equanimity as mildly to wonder what he would be having for supper, treatment has failed."

There are two hierarchies which establish themselves in groups as the result of the patients' responses to the total constellation of field forces operative in them : the hierarchy of dominance, and the scales of popularity.

The hierarchy of dominance was found to have had no effect on the therapeutic outcome of treatment. This finding may at first appear to be contrary to expectation. One might have supposed that a patient who was able to exert a conspicuous influence on group events would have tended to lead the group in a therapeutic direction. This was, however, not the case. First of

all, a dominant person need not necessarily be a leader. A scapegoat or a paranoid and aggressive person can acquire a dominant status but without leader qualities. Secondly, a patient may gain true leadership and yet exploit the group for personal ends. He would then be likely to guide the group along pathological pathways. Here again a group can reflect, in miniature, events which have become all too familiar on a large-scale international plane.

The lack of correlation between dominance and therapeutic results obliges the therapist to utilize his unique group position of prestige and transference popularity in order to pilot the group towards a therapeutic goal.

Laliophobic patients are not necessarily devoid of dominance. If and when they can overcome their fear of speaking they can gain an influential position by aggressive and self-assertive arguments. There was no correlation between dominance and laliophobia.

The investigation of the popularity of patients revealed that there are two independent types of popularity. One type is based on the feelings of friendliness evoked directly by the interplay of personalities. This "direct" popularity is essentially a phenomenon of private pairing without any reference to an immediate group situation. A popular person in this sense is one who is chosen as a desirable private companion by a majority of people in a community. Direct popularity can therefore be assessed with the help of Moreno's (1934) "sociometric test." It was found that in a therapeutic group direct popularity is of little account, has no influence on the therapeutic outcome, and is so inconspicuous during group sessions that members are, in general, not aware of their own status of direct popularity.

This finding seems to contradict the results of investigations of the sociometric school. But this contradiction is only an apparent one. The communities examined by sociometrists had a greater social mobility than therapeutic groups. In those communities members could associate in pairs, triangles or bigger sub-groups, based on direct friendliness and detached from the influence of the wider community. In a therapeutic group no detached pairing of members is possible without a disruption of the immediate group situation. It seems that this is the main reason why direct popularity is so little in evidence in therapeutic groups.

The second type of popularity, which has been termed group popularity, is one that arises immediately out of the group response of the patients. It is therefore not only group-determined, but also overt and noticeable in the group. It was found that this group popularity had a significant positive correlation with the differential therapeutic result of treatment.

Laliophobic patients, because of their aggressive leanings, tended to have low group popularity. The question arises here: Is the degree of group popularity a patient achieves a prognostic indicator of the benefit he can derive from treatment? Or is it merely a sign of his neurotic inability to speak freely in the group? The same question may also be asked with regard to positive identifications with the group, and the upset caused by sexual group discussions.

In the present investigation laliophobia has loomed rather large, but there are other types of patients, e.g. those with paranoid, obsessive, aggressive or

unduly intellectualizing tendencies, who are also apt to be unpopular, detached from the group and relatively undisturbed by sexual discussions. Group popularity, group identifications and an anxious response to sexual group discussions may therefore be considered to be valid + favourable prognostic criteria of the therapeutic outcome of group treatment.

SUMMARY.

The therapeutic factors in two sexually mixed groups of 7 members each have been examined.

It was found that certain field forces may have a generally beneficial effect, such as the common transference to the therapist, the group task of candid self-revelation, the emotional and intellectual responses to interpretations, and the sexual composition of the group.

Other group influences had a differential therapeutic effect. Among these the general verbal group task was of particular importance. Laliophobic patients who were unable to comply readily with this task did not respond as favourably to group treatment as other patients.

Of favourable prognosis was the ability to form positive identifications with the group, to be more disturbed by sexual topics of discussion than by other group events, and the attainment of a high degree of group popularity.

Group popularity was distinguished from direct popularity. The latter was based on the desires for private friendship which patients felt for each other. It had no reference to group performance, and had no effect on the therapeutic outcome.

The degree of dominance which patients gained in the group had no influence on their improvements.

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MENINGIOMAS WITH DEMENTIA AS THE FIRST AND PRESENTING FEATURE.

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THE purpose of this paper is to call to the attention of neurologists, psychiatrists and neurosurgeons a group of meningiomas with dementia as the earliest and presenting symptom. The diagnosis in these cases is apt to be missed, especially if the patient is in the arteriosclerotic or presenile age-group. This is equally true of other tumours, but the practical importance of early diagnosis of meningiomas is that with the removal of the tumour the patient usually recovers from the mental illness.

A great many patients with brain tumours show mental changes in the form of apathy, inattention, dullness and, in the later stages, drowsiness, stupor and coma as the result of increased intracranial pressure. With the symptoms so caused this paper is not concerned.

The dysphasias, dysgnosias and dyspraxias are in a sense mental disturbances, but are easily distinguished from dementia if the neurological examination is complete.

That dementia may be caused by frontal gliomas is well known (Sachs, 1930). Less well known is the fact that third ventricle tumours (Riddoch, 1936), posterior fossa tumours (Brain, 1931, and Wilson and Rupp, 1946) and temporal lobe tumours (Golla, 1931) may also have dementia as their presenting feature. It is interesting that tumours in these widely separated areas may show both the intellectual impairment and the personality disorder which are the constituents of dementia. Mental symptoms in brain tumour patients have been studied by Davidoff (1930), Sachs (1930), Jefferson (1939), Whitfield (1946), and McIntyre and McIntyre (1942). Busch (1940), in a remarkably thorough paper, analysed the occurrence of mental symptoms in various types of tumours on a histological and topographical basis.

The following 8 cases of meningioma, in which dementia appeared as the initial symptom preceding the development of those commonly regarded as indicative of cerebral tumour, have been collected from the records of Mr. Wylie McKissock of 48 verified meningiomas at the National Hospital (1945-49), and 187 surgically verified meningiomas from the Atkinson Morley Hospital (Mr. Wylie McKissock and Mr. Valentine Logue, 1936-49). This group, therefore, represents the approximate incidence (3.4 per cent.) of this syndrome among 235 intracranial meningiomas. This series is comparable to that of Cushing and Eisenhardt (1938).

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CASE 1.—Mrs. F. G—, aged 64, was admitted to the National Hospital on 12 December, 1940, under the care of Sir Charles Symonds. Her past history and family history were irrelevant. The history had to be obtained from the husband, as the patient was unable to give an account of herself. She said she had many troubles, but could not state them.

Her present illness probably went back two years, during which time she was excessively preoccupied with the ills of her pet dog. For three months she had had episodes of trembling all over, worse in the morning, but these were not associated with any disturbance of consciousness. She became progressively more forgetful and muddled in her mind, and lost all initiative. For three weeks she had been confined to bed and was doubly incontinent, mainly because she appeared to lack the initiative to go to the bathroom, as she was quite able to get about. She became so confused that she was utterly unable to dress herself. She had no headache, no fits and no vomiting. She had a good appetite and slept well.

Physical examination in the out-patient department of the National Hospital was normal except for profound dementia. She could not co-operate for any tests of intelligence. She was disoriented in time and place. Her blood pressure was 100/60. The E.E.G. showed a "gross destructive lesion of the left fronto-temporal region, probably a rapidly growing tumour." The skull X-rays showed marked erosion of the posterior clinoids, indicating increased intracranial pressure. The patient was admitted to the National Hospital, where further clinical examination revealed no more positive neurological signs except a persistent tremor of the extended hands. She lay inert in bed, but was not difficult to rouse. There was no aphasia, apraxia or anosmia. The cranial nerves were all intact, as were the reflexes, except for an equivocal extensor plantar response on the left. There was no weakness of the arms or legs, and sensory examination appeared normal, as far as could be determined from the patient's incoherent responses. X-rays showed that the left foramen spinosum was enlarged. An arteriogram strongly suggested a left, frontal, parasagittal meningioma because of a characteristic "blush." On 1 January, 1950, a 33-gm., left frontal, parasagittal meningioma was removed by Mr. McKissock.

Two months after the operation the patient was up and about, her course having been complicated by a wound breakdown. Her mental state was entirely normal. She recalled little of her pre-operative condition except that she had been distressed over her incontinence. Her tremor had disappeared and her plantar responses were flexor. She felt better than she had for years.

Comment.—This patient had no symptoms of intracranial disease except for her dementia and incontinence. Her neurological examination was repeatedly negative, except for an inconstant and doubtful plantar response, a slight facial weakness and the peculiar tremor. The fact that post-operatively she remembers having been distressed over her incontinence is important. The E.E.G. and X-rays were the only conclusive signs of an expanding lesion, and both of these were more suggestive of a malignant lesion than a benign one. The enlarged foramen spinosum on the left, a sign which we have come to find valuable as suggestive of meningioma, was the only evidence for this type of tumour before the arteriogram.

CASE 2.—Mrs. M. P—, aged 26, was admitted to the National Hospital on 6 October, 1945, under the care of Dr. E. A. Carmichael, with the chief complaint of confusion and lack of memory for several months. Her family history was unobtainable. The past history was irrelevant.

The present illness began several months before admission, with progressive confusion. She found herself unable to change money, and she "made silly mistakes." There was progressive deterioration in memory for recent and remote events. She was quite aware she was failing mentally and was quite worried about it, fearing she was losing her mind. Two weeks before admission she had a severe generalized headache, "like a pressure." During the week before admission there was intermittent vomiting. She had no aphasia, diplopia, disturbance of con-

sciousness, loss of vision, paresis or tinnitus. Her husband noted nothing wrong with her until two weeks before admission. There was no incontinence.

Examination.—The patient was drowsy, inattentive, slow and forgetful. Memory for recent and remote events was very poor. She could not remember when she was married, or when she came to the hospital. She was unable to co-operate for the simplest intelligence tests. There was no aphasia or apraxia. She had bilateral papilloedema, more on the left than the right. There was a right lower facial weakness of the central type, and a slight weakness of the right arm, which was clumsier than the left. Reflexes on the right were brisker than on the left. The right abdominal reflexes were absent. The right plantar response was equivocal or extensor. There was no sensory defect to gross testing, but co-operation was so limited that careful evaluation was impossible. Plain X-rays of the skull showed some erosion of the posterior clinoids. E.E.G. showed "severe, generalized, slow activity, probably related to pressure." A ventriculogram revealed a "big, posterior, left-sided tumour, probably a glioma."

On 11 October, 1945, a craniotomy was performed by Mr. McKissock. The brain was very tight and tended to herniate through the dural opening. Probing for the tumour with a brain needle "revealed a tumour typical in consistency of a mixed glioma in the fronto-parietal area." It was felt that no useful purpose could be served in extirpating this tumour, and the wound was closed.

The patient died the night of the operation. Autopsy (confined to the head) revealed a large bilobed, fibrous meningioma in the falx between the frontal lobes. It lay about half-way between the frontal poles and the Rolandic fissure. Histologically it was a typical fibrous meningioma. There was severe bilateral tonsillar and uncinate herniation, greater on the left.

Comment.—This patient showed only progressive dementia and worry about losing her mental powers for several months before the classical signs of headache, vomiting and papilloedema appeared. By that time right pyramidal tract signs left no doubt that she had a brain tumour. A meningioma was never suspected pre-operatively, and the operative probing was entirely misleading.

CASE 3.—Mrs. E. T—, aged 63, was admitted to the National Hospital on 15 December, 1948, under the care of Sir Charles Symonds. The patient was unable to give a rational history, hence it was obtained from relatives, and apparently had begun a year before, when her mental faculties began to fail. She lost track of the days of the week, began to repeat herself, and made serious mistakes in judgment and money matters. There were lucid intervals of normal mentality during this time. She had occasional slight frontal headaches. There were no fits, vomiting, weakness, visual disturbances, paraesthesiae or dysphasia. Examination at the National Hospital showed constant plucking, fiddling movements with both hands, marked dementia, and inability to concentrate. When asked questions she frequently became mute, smiled, and was quite inaccessible. She was completely disoriented in time, place and person. There was mild confabulation, slight drowsiness and no co-operation. The fundi were normal. Except for a slight inequality of the pupils, the left being slightly larger than the right, the cranial nerves were normal, as far as could be tested. Motor power was poor because of inadequate co-operation, but there was no paresis. There was bilateral ankle clonus, and both plantar responses were extensor. Sensory examination could not be done, though she responded to pin-prick equally on each side. Skull films showed the pineal pushed way down, but in the midline, though this was not appreciated until post mortem. Pneumo-encephalogram produced no filling of the ventricles. C.S.F. was normal with a protein of 15 mgm. per cent. The patient died of bronchopneumonia on her 14th hospital day, without surgical intervention.

Autopsy revealed a small meningioma, about 15 mm. in diameter, growing forward in the midline from the anterior end of the junction of the tentorium and the falx. It was slightly adherent to the splenium of the corpus callosum. The pineal lay between the splenium and the colliculi, but the latter were not deformed or adherent to it. There was no uncinate herniation, and only slight tonsillar herniation.

Comment.—This was a very small, low-lying posterior falx meningioma, arising where the inferior longitudinal sinus and the vein of Galen meet to enter the sinus rectus. This is a very rare site for falx meningiomas to arise. A similar case was reported by Balado and Tiscornia (1927). Our case showed massive dementia but no evidence of increased intracranial pressure despite a year's history. A month before her death she showed only a depressed pineal gland, incontinence, tremor and a left plantar extensor response. Headache was not a prominent sign. The plucking, purposeless movements of the hands are interesting, but certainly non-specific in character. Ventriculography should have been done when encephalography did not fill the ventricles. The tumour was small, benign, pedunculated and probably removable.

CASE 4.—Mrs. D. B., aged 41, was admitted to the Atkinson Morley Hospital on 11 August, 1942, under the care of Mr. McKissock. Her family history was irrelevant. The past history revealed that her right eye had been partially blinded by a hat pin at the age of 15. She had been struck by a golf ball in the left frontal region 18 months previously. The present illness began, roughly, five months before admission, with a vague feeling of tiredness and weakness. She complained of headache during her morning bath, when she often felt faint, and occasionally vomited. She was rather confused, and unable to cite definite incidents. She complained that her memory had become very bad. Recently she had been doing strange things, like getting dressed and going for a walk in the middle of the night. Nothing more than this could be obtained from the patient. She was grossly demented, confused, deteriorated, incontinent and inaccessible. Information from the Stanboroughs Hospital, where she had previously been admitted, told of two periods of "stupor," one lasting four days, and one briefer attack a few days before admission.

Examination.—The patient was intellectually deteriorated, confused, disoriented, and had trouble remembering her own history. Her attention wandered. She was right-handed, and showed no dysphasia or dyspraxia. The cranial nerves were normal except for a slight fullness of the retinal veins and loss of the physiological cup on the left. There was no anosmia. Motor power and tone were entirely normal, as was co-ordination. The reflexes were all equal and active. The abdominal reflexes were present and the plantar responses were flexor. There was no disturbance of sensation. Her blood-pressure was 100/80. Skull films showed "a ring of venous channels in the right frontal region in the centre of which is a bony enostosis extending backwards on the roof of the orbit and down to the cribriform plate. There is some erosion of the clinoids. The right foramen spinosum is larger than the left. This suggests a right frontal meningioma."

On 17 July, 1942, a ventriculogram revealed a right frontal neoplasm, and on the same day Mr. McKissock removed most of an exceedingly vascular meningioma arising from the posterior part of the right frontal sinus. The operation was discontinued before the hyperostosed portion of the roof of the orbit could be removed. The patient recovered perfectly from this difficult first-stage operation, and two months later a second-stage operation was done, removing the bony hyperostosis. She was discharged three weeks after this procedure, feeling perfectly well and with no abnormal physical signs. She was last seen on 25 April, 1949, almost seven years after operation, at which time she looked and felt well. Her neurological examination was normal. She had recently won a local golf championship.

Comment.—This was a pre-olfactory anterior basal meningioma, and presented with symptoms of dementia, confusion, disorientation and inaccessibility. She had no anosmia, which only about half the patients with olfactory groove meningiomas have—a sign which is easily missed in a confused patient who cannot co-operate for a sensory examination. There were no pyramidal

tract signs. There was minimal fullness of the retinal veins, and loss of physiological cupping, and it was the astuteness of the radiologist which first suggested the diagnosis. Here again the foramen spinosum was enlarged.

CASE 5.—Mr. F. G., aged 67, was seen in consultation by Mr. Valentine Logue, at the request of Dr. Bond, at the Royal United Hospital, Bath, on 3 November, 1944. This history was obtained from his wife. He had been perfectly well until nine months previously, when there was an insidious onset of a quiet, vacant manner, and his memory began to deteriorate. This was associated with vague headache. He worked as a stone-mason until four months previously. He had general malaise, and his vacant manner increased. He took to his bed, and had not been out of it since. He deteriorated rapidly, and had to be attended by a nurse; he became childish, was occasionally doubly incontinent and unable to feed himself. One month previously a small lump was found on his head, to which little attention was paid. He was presumed to be suffering from arteriosclerotic dementia, similar to an illness of his brother, who had had paralysis agitans.

Examination.—He was completely disoriented in time and space, grossly demented and difficult to examine. He tended to fall asleep during the interview. There was no power of concentration and no co-operation for the simplest mental testing. He was left handed. There was no aphasia, agnosia or apraxia. His general condition was poor; he was wasted and dehydrated; his neck was stiff; there was a non-tender swelling, 5 cm. in diameter, to the left of the vertex. There was a slight left facial weakness, but otherwise his cranial nerves were normal. There was no anosmia, and the fundi were normal. There was a spastic quadriplegia, greater on the left, although his tendon reflexes were greater on the right in the arms and legs. The right plantar response was extensor, the left equivocal.

Skull films showed the clinoids to be rarified. There was no bony density corresponding to the lump at the vertex, though two large vessels ran up to this area. A meningioma was suspected. Ventriculogram and craniotomy were performed on the same day, and a 91-gm. parasagittal meningioma was removed by Mr. Logue. The superior longitudinal sinus was not involved. The bone flap was invaded by tumour and had to be sacrificed. After an initially good recovery he suddenly died three weeks post-operatively. Autopsy was not permitted.

Comment.—This patient presented symptoms of such gross dementia, deterioration and childishness that his slight headaches and the lump on his head were not appreciated. His spastic quadriplegia was more suggestive of a spinal cord lesion than cerebral tumour. Skull films gave the most suggestive hint as to the diagnosis of a parasagittal meningioma.

CASE 6.—Mrs. E. J., aged 57, was admitted to the Atkinson Morley Hospital, Wimbledon, under the care of Mr. Logue, on 22 March, 1948. The history was obtained from her husband. The family history and past history were irrelevant. About three months before admission she changed in behaviour. She lost interest in her home and herself. She didn't wash, became very sloppy, and showed marked mental deterioration. She was muddled, confused, incontinent and obviously demented. It was incidentally mentioned she had lost her sense of smell two years before. There were no headaches, fits or vomiting.

Examination.—The patient was markedly demented. She could not co-operate for the simplest intelligence tests. Her mood was one of depression. There was considerable loss of affect, and her behaviour was inappropriate to the situation. The skull was normal. She was recorded as showing "no anosmia." There was early papilloedema, and a slight left facial weakness. There was no abnormality of strength, tone or co-ordination in the arms or legs. The abdominal reflexes were absent; the plantar responses were flexor. Sensory examination was impossible. The E.E.G. showed a diffuse, unlocalized abnormality.

On 1 April, 1948, a ventriculogram showed a gross filling defect of both frontal horns as far back as the foramen of Monro, and on the same day Mr. Logue removed a huge olfactory groove meningioma extending from the back of the right frontal sinus to the sella, and along the sphenoid ridge on the right to the pterion. The part on the right was removed as a first-stage procedure, and three weeks later an

equally large extension was removed from the left anterior fossa. She recovered extremely well, was up and about on her 14th post-operative day and was improving mentally. Three and a half weeks after operation she had a sudden pain in the chest and died of a pulmonary embolism. Autopsy revealed its source in the right sphenous vein. The brain showed no residual tumour.

Comment.—This patient showed such overwhelming dementia that her history of anosmia was not appreciated and, in fact, it was not confirmed by examination in her demented state. She showed only early papilloedema, incontinence and a slight facial weakness. The E.E.G. was helpful in showing a diffuse, though unlocalized abnormality, whereas the skull films were negative.

CASE 7.—Mr. F. W., aged 67, was admitted to the National Hospital, under the care of Sir Charles Symonds, on 30 March, 1949. He was a retired headmaster of a school and was well known for his intellect. His chief complaints were inertia, loss of self-respect and uncleanness for six months. Visual hallucinations had been present for three months. He refused to give his family history or past history. He was in good health until six months before admission, when his attitude toward life changed. He didn't want to get up in the morning, which he regarded as a nuisance, because he would have liked to go for a walk, but he was "just too lazy." He didn't wash, shave, or dress himself. He wouldn't eat until stupid whims were satisfied. He changed from a considerate man to being very inconsiderate of his ill wife, on whom he put undue hardship. He was unconcerned about this. He became irritable and intolerant. For six months his visual acuity had been failing, especially in his left eye, which had been the stronger eye. For three months he had visual hallucinations occurring in any part of his visual field appearing as flowers or dogs' heads, and lasting from the time he went to bed until he went to sleep. He denied any real headache. For the last year there had been shortness of breath when climbing stairs. He had not been incontinent until he entered the hospital, when he wet the bed the first two nights "because he was too lazy to get up." He considered anyone a fool who was not incontinent! There were no fits or diplopia. He thought his memory was good. His son thought the chief change was in his negativism, stubbornness and lack of consideration. He refused to take a bath, but when finally forced to, refused to get out.

Examination.—He was stubborn and negativistic on the ward and frequently incontinent. He could discuss world affairs apparently intelligently on a high plane, but with no judgment or insight, and with complete intolerance. It was difficult to hold his attention, as he was euphoric and overactive. Intelligence tests showed some uneven falling off from what was obviously a superior level previously. There was no dysphasia, dyspraxia or agnosia. He did the 100-7 test in two and a half minutes with three errors. He was totally unable to do any of the similarity or proverb tests. There was bilateral anosmia. Visual acuity was down to 6/36 on the right and 6/24 on the left. The fundi were normal. The rest of the cranial nerves were normal except for slight bilateral deafness of long standing. Examination of his motor system, sensory system and reflexes showed them to be entirely normal. His blood-pressure was 160/90. He was thought at first to be suffering from presenile dementia of the Pick's variety, until his C.S.F. protein was discovered to be 130 mgm. per cent. Together with his anosmia, this strongly suggested a tumour. X-rays were reported as negative. The E.E.G. showed a left frontal lobe focus of abnormal activity.

Ventriculography on 11 March, 1949, revealed both anterior horns of the ventricles pushed up and back, and the same day Mr. McKissock removed a large olfactory groove meningioma after amputation of the left frontal pole. It extended under the falx for a short distance and compressed the right frontal lobe. The patient recovered well after a period of initial confusion, incontinence and lack of initiative. On re-examination of his plain skull films in retrospect, there was some sclerosis of the olfactory groove and calcification behind the frontal sinus.

He was last seen on 16 January, 1950, eight months after operation, feeling perfectly well. His mental state was normal except for possible slight euphoria, and he complained of momentary episodes of forgetting what he wanted to say.

Comment.—Like Case 6, the deterioration of this elderly man was compatible with an arteriosclerotic dementia, or with Pick's disease. He showed no pressure signs. Except for the anosmia and the high C.S.F. protein this diagnosis could have been missed, and the patient might have ended up in a mental hospital. The E.E.G. was very helpful in this instance, and the X-ray was positive, although the abnormalities were not appreciated before operation.

CASE 8.—Miss H. L.—, aged 69, was admitted to the National Hospital on 27 October, 1948, under the care of Dr. S. P. Meadows, because of depression of six months' duration. Her family history and past history were irrelevant. The patient was unable to give any history herself. The account was obtained from a sister and the family doctor. One year before, she underwent a personality change, becoming more querulous, hypochondriacal and aggressive than was normal for her. Six months previously she became severely depressed, but this was not constant. She became very weepy, self-reproachful, and gradually deteriorated mentally. Her housework fell off in efficiency, and she lost interest in her appearance. Six weeks previously her table manners became careless and sloppy, and she stuffed food into her mouth with both hands. She ate ravenously and almost anything. She became confused and had trouble dressing herself properly, getting "lost in her clothes." For three weeks she had been incontinent of urine, being upset and ashamed of it. For this length of time she had had attacks of headache. For one week she was apathetic.

Examination.—She was semi-comatose but could be roused. She was completely unco-operative. After magnesium sulphate enemata she improved, but still could give no history or reliable responses on sensory examination. She was not aphasic, but her speech was inappropriate. She was unable to co-operate for any simple intelligence tests. She had a curious disinclination to move her left limbs. She was right-handed. There was slight bilateral papilloedema and a marked left lower facial weakness. There was slight increase in tone in the left arm, but no weakness. Extension of the left arm could not be maintained against gravity. Reflexes in the arms were greater on the left than the right. The plantar responses were flexor. No sensory findings could be relied upon because of her confusion.

Skull X-rays showed pressure changes in the posterior clinoids, and the pineal gland was shifted to the left. The E.E.G. was grossly abnormal, suggesting a space-occupying lesion in the right temporo-parietal region. The C.S.F. was not examined.

A ventriculogram revealed a large right parietal convexity neoplasm. Needle biopsy was done and a glioma was suspected, but the permanent sections revealed a meningioma. Right percutaneous arteriography revealed a "blush" in the phlebograms, suggesting a right parietal parasagittal meningioma. On 25 November, 1948, Mr. McKissock removed a large meningioma from this area. Her post-operative course was complicated by a spinal-fluid fistula requiring a secondary operation and re-suture. She was eventually discharged 13 January, 1949, in excellent condition, normal mentally and negative neurologically. She was last seen 4 July, 1949, six months after operation, with no complaints and a normal examination.

Comment.—The slowly progressive dementia in this elderly woman was thought to be senility for a year before her tumour was recognized. Fortunately the mental changes were reversible. The headache, papilloedema, incontinence, facial weakness, pyramidal tract signs and parietal lobe symptoms, in addition to positive X-rays and E.E.G., were all available to make the diagnosis, though overshadowed by the dementia.

DISCUSSION

Dementia as the presenting or earliest symptom of meningiomas has not been emphasized previously. Cushing and Eisenhardt (1938), in their classic

study of meningiomas, list mental changes as an infrequent presenting complaint, even of the olfactory groove tumours. Of their 29 tumours in this region, they state, "In six instances personality changes were inaugural." Of their total of 295 intracranial meningiomas, probably only 12 showed dementia as the first symptom.

Henderson (1938) stated that mental changes were uncommon before the terminal stages of blindness in cases of anterior basal meningiomas. Our cases do not corroborate this. Busch (1940), however, stated that mental changes may long precede other symptoms in anterior fossa meningiomas. McIntyre and McIntyre (1942), in a psychiatric paper which is refreshing in its "brain tumour consciousness," reported four meningiomas among seven cases of brain tumour with primarily psychiatric symptomatology. Davidoff (1939), Sachs (1931), Jefferson (1939), Rylander (1939), Wilson and Rupp (1946) and Whitfield (1946) have reported cases of meningioma whose symptoms were virtually of dementia only.

Of these eight cases, six were women and two were men. Six were in the

Case.	Sex.	Age.	Site.	Length of history.	Head- ache.	Vomit- ing.	Papill- oedema.	Anos- mia.	In- conti- nence.	Tremor.	Visua sym- ptom.
1. F. G—	♀	64	L. para- sagittal	5/12	o	o	o	o	+	+	o
2. M. P—	♀	26	Anterior falcx	3-4/12	+	Occasional	+	—	o	o	o
3. E. T—	♀	63	Posterior falcx	12/12	Slight	o	o	—	+	+	o
4. D. B—	♀	41	Pre- olfactory	5/12	Slight	Occasional	Slight	o	o	o	o
5. F. G—	♂	67	R. para- sagittal	9/12	Slight	o	o	o	+	o	o
6. E. J—	♀	57	R. and L. olfactory groove	3/12	o	o	+	+	+	o	o
7. F. W—	♂	67	L. olfactory groove	6/12	o	o	o	+	+	o	+
8. H. L—	♀	69	R. parietal parasagittal	12/12	Slight	o	+	o	+	o	o

Case.	Pyra- midal Facial.	signs.	Sen- sory.	Plain X-ray.	E.E.G.	Arte- rio- graphy.	C.S.F.	Clinical diagnosis.	Exos- tosis.	Result.
1. F. G—	+	+	o	+	+	+	o	Bi-frontal glioma	o	Operation. Improving 2/12
2. M. P—	+	+	o	+	+	—	o	Inoperable glioma	o	Biopsy. Died.
3. E. T—	o	+	o	+	o	—	T.P. 15	? B.T.	o	Died without operation.
4. D. B—	o	o	o	+	o	—	I.P. 120 T.P. 30	? B.T. ? Menin- gioma.	o	Two operation Well seven years later.
5. F. G—	+	+	o	+	—	—	—	A-S dementia.	+	Died three weeks after operation.
6. E. J—	+	o	o	o	+	—	I.P. 240 T.P. 25	? Olfactory groove Pick's disease	o	Died. Pulmo- nary embolu- sion.
7. F. W—	o	o	o	+	+	—	+	A-S dementia	o	Operation. Improving 6/12
8. H. L—	+	+	o	+	+	+	—		o	Operation with recovery 6/12.

latter period of life, a fact which made the diagnosis of presenile dementia more probable. Six of the tumours were frontal, one in the posterior one-third of the falx in the pineal region, and one parietal parasagittal. The accompanying table shows well how few were the localizing signs and symptoms in these demented patients. Obviously the frontally situated tumours are most likely to give rise to mental symptoms. The fact that dementia may occur with lesions situated elsewhere is important.

Jefferson (1939) stated that 90 per cent. of his frontal meningiomas had "pressure signs." It should be brought out here that the triad of "headache, vomiting and papilloedema," thought to be the usual hallmark of brain tumour, is a manifestation of far-advanced disease, wherein the risks of operation are greatest for the patient, and the task for the surgeon most trying. Two of these patients showed the triad by the time they came to the hospital, but two others showed none of the triad. Four of the eight had no papilloedema. Only one complained of severe headaches, and four others had slight headaches. Two of the three olfactory groove tumour cases showed anosmia. This may be an invaluable sign if the responses of the demented patient can be relied upon. It was present in only 14 of Cushing and Eisenhardt's 29 olfactory groove tumours, and was a chief complaint in only three.

Six of these eight cases were incontinent of urine or faeces, or both. This is a well-known symptom in frontal neoplasms. It has been studied particularly by Langworthy (1936) and Watts and Uhle (1935). Its transitory occurrence after frontal leucotomy is quite constant. The fact that two of these cases admitted distress over their inability to hold their urine is an important point in favour of the thesis that this form of incontinence is due to disturbance of a cortical representation of the bladder, rather than a mere disregard for their personal cleanliness.

Tremor was present in two cases. So-called "frontal tremor" is another interesting phenomenon, the cause of which is unknown. It was characterized in these cases by rather coarse, regular, alternating movements of the extended arms involving the entire limb. It is probably of no localizing value, but may be a suggestive sign at least of organic disease. The studies of Critchley (1930) on thrombosis of Heubner's artery, and more recently those of Smyth (1941) who found pathological cell changes in the contralateral dentate nucleus of four patients with frontal lobe lesions who had tremor or ataxia, are of interest in this respect.

In five cases some minimal pyramidal tract signs were present.

A slight lower facial weakness was present in five cases. Sachs (1930) found this in 32 of 45 space-occupying lesions of the frontal lobes. It is valuable when present, but obviously not invariable.

The plain X-rays of the skull in seven of the cases indicated an intracranial tumour, although the changes were not gross and consisted of rarified clinoids, a shifted pineal, abnormal density or vascular channels in the bone.

The EEG suggested a space-occupying lesion in five cases, in one of which the skull films were negative. The spinal fluid was helpful in one case only. The pre-operative clinical diagnosis was meningioma in only two cases.

In every-day neurological and psychiatric practice one meets frequently with

the problem of diagnosis of the demented patient. The commonest causes are probably arteriosclerotic cerebro-vascular disease, tumour, Pick's disease and dementia paralytica. Minimal signs may be present in the cases with arteriosclerosis or Pick's disease, as well as in the cases with brain tumours. The diagnosis can be established in these cases by full investigation only, and, in a certain proportion, the lesion may be a benign, removable tumour. Three to four per cent. of all meningiomas may have this syndrome as their presenting feature. It must not be assumed that demented patients with minimal signs have degenerative conditions or malignant inoperable tumours, as they may harbour a curable meningioma.

CONCLUSIONS.

1. A significant proportion of meningiomas in various locations have dementia as the earliest and presenting feature.
2. Eight such cases are reported and analysed.
3. Careful, complete neurological examinations in demented patients must be done, in conjunction with accessory methods of examination, to bring the curable tumour cases to the neurosurgeon.

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A CASE OF SCHIZOSIS WITH DUAL PERSONALITY.

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MULTIPLE personality in its true form is a comparatively rare occurrence. Taylor and Martin (19) in a recent survey place the estimate at about 150 cases. In their definition, however, they exclude many cases which seem "too hypnotic, narrowly hysterical, evidently organic, psychotic, likely faked, or insufficiently described to be called multiple personality." The following case, although it might fall into the "narrowly hysterical" category, appears to be of sufficient interest to justify publication.

The patient, Alexander M—, had written a book about a character whom he called David Dawson. He apparently assumed the identity of this fictitious person and was admitted to hospital as such, believing that he had, in turn, written a book about a character whom he called Alexander M—.

David Dawson came under observation as a case of attempted suicide by coal-gas. He showed some loss of memory, which gradually "improved" whilst in hospital. His story was as follows :

He was born in Ireland, educated in Belfast, and left school at 17. Both his parents died at this time. He was an only child who had a happy home life. He was fond of his mother, but less so of his father, who was reserved and forced him to go to the Presbyterian Church. His parents had no relatives. After their death he went to London, where he was engaged as a journalist with a sporting periodical. He remembers nothing from this time until he joined the army as a volunteer in 1939. He rose to the rank of staff sergeant in the R.E. His fiancée, Kitty, also volunteered for the services, and subsequently she was seduced by someone else and broke off the engagement. While serving in Ireland he broke down and was taken to a mental hospital, where he was treated by narcoanalysis, returning to duty thereafter. As a staff sergeant he refused a commission to avoid responsibility. He served in the Middle-East campaign and flew in sorties to Arnhem. He was vague about his life since demobilization in 1945. At this time he felt the urge to write a book to show the purpose of life. He thought he had come through the war uninjured because he had this mission to fulfil. Since his demobilization he had travelled about England, and had done no work except writing his novel. He eventually reached Glasgow, feeling impelled to do so. He said he "felt he was looking for something." He went to live in a lodging which he had seen advertised and told the landlady that he was a journalist. At night he worked on his book. He continually brooded over the reason for his presence in Glasgow. He felt depressed, suffered from headaches and insomnia. He had phases when he felt as if he were standing apart from his body ; as if it were a puppet controlled by himself and somebody else ; as if

someone else were present whom he could not see ; that happenings around him had a special significance for himself ; and that he was living in a dream world and " drifting." He imagined that items in the newspapers referred to his inability to complete his book, and that strangers on tramcars stared at him as if aware of his confusion and failure. He felt he had some responsibility for the disturbed political state of the world. He finally made a determined attempt to commit suicide by gas. This failed only because of the unexpected return of his landlady. He said that he had possessed documents, the name on which conveyed nothing to him. These documents he burned along with his book prior to the gassing. He was amazed to find that he had recovered, but said, " now that I am born again, as it were, I shall try to help other people from now on." He claimed to have foreseen Hess's flight to Britain, the course of the Middle East campaign and the name of a Derby winner. His landlady was interviewed, and described him as a quiet young man who did not go out very much and who avoided contact with the other lodgers.

He was in hospital for three months with the provisional diagnosis of schizophrenia. He had given an Army number, rank, regiment, and name, but the military authorities were unable to trace him. In view of the blanks in his memory and our inability to trace his home it was decided to hypnotize him. The following story emerged under hypnosis :

His real name was Alexander M—, and he was born and educated in England. He was the eldest of the family, there being twelve years between him and his sister. He was left much on his own but had many friends. His father was very reserved, and not given to conversation with his own family. He was strict in manner, seldom at home, and usually arrived home late at night, drunk. He preferred his daughter. Alexander M— considered that his father's habits were cruel to his mother. He often had nightmares as a child and went to his mother for comfort. He left school at 17½ years and at 21 became engaged to a girl-friend Kath. His father, however, was not prepared to allow him to marry so early. His fiancée and he began to feel frustrated, gradually became estranged and broke off the engagement. Until 1937 he was a clerk in a responsible concern, when he volunteered for the army. He was eventually posted to Ireland, where he met his wife, whom he married in 1941. They now have one son. In 1941 he had a " nervous breakdown," during which he waited for three days on a mountain to intercept an emissary of the German Government, and a few days later he failed to recognize his colonel. He received treatment in hospital after this episode. He served thereafter in the Middle East. A further breakdown with amnesia occurred in 1945, when he was again confined to hospital. In 1946 he was demobilized and has since held a similar responsible job. About that time he had rented a furnished house from which the landlord now wished to evict him. He told how during the war, while talking to men in the units, he found that either the men were very cynical about life in general if educated, or if uneducated that the level of their minds did not rise above " beer, baccy and bed." He thought that by writing a book he might help people to find the purpose of life. He had no ending in view for the novel when he started to write it, but thought that the ending would be revealed to him.

The book, called *Purpose*, as told by Alexander M— under hypnosis was briefly as follows :

"The hero, David Dawson, was born in Ireland and went to school there. His father was a grocer and Presbyterian. David Dawson contrasted the purpose of life as taught by religious thought with what he had been taught in school. After leaving school the father died. The business failed and was sold. David Dawson went to Belfast with his mother, who died there shortly after. He took up journalism, his secret ambition, and went to London. There he had a love affair with Kitty, his landlord's daughter. At this point he contrasted the purpose of life as propounded by his girl friend, who fired him with ambition to get married, to that of his employer, who was 'making a good thing out of the British people's desire to get rich quickly by means of competitions and football pools.' The book continued that in 1939 David Dawson volunteered for the forces after a heated argument with his employer. Kitty joined the W.A.A.F., was subsequently seduced and became pregnant. At this time the evacuation of France took place, but David Dawson was more concerned with the problem of Kitty, whom he still wished to marry, but who was already married. He embarked with the B.E.F. and awakened to find that he was sailing up Belfast Loch, the land of his birth. He was posted to Ireland, where he had a nervous breakdown and was finally demobilized. Towards the end of the book he tried to sum things up and to see if he could reach some conclusion as to the purpose of life, but despite all the theories the hero had heard—religious, scientific, those of his girl friend, cynics and moralists—he was unsuccessful. He then set off on a tour of England to meet various people. He ultimately went to Glasgow, because many of the worst housing difficulties of the day were centred there, and the purpose of life could not be achieved without happy living in a good environment. A full and contented life, however, could be achieved if we all worked for the common good and helped each other through our difficulties."

It was while working on these chapters that he felt dissatisfied and depressed because he could not see how he was going to end the book. He had had no ending for the book in view when he had started to write it but had thought that the ending would be revealed to him.

Under further hypnosis, he recalled that he had really first realized that he had wandered from home when he was in Glasgow working on his manuscript. He thought he was David Dawson at that time. He then described his attempted suicide by coal-gas, the account of which was similar to that told by David Dawson. He mentioned that he burnt his book and some documents prior to the gassing in the hope that someone else would be considered as dead. He said he did not recover from the poisoning.

The patient was hypnotized for the first time three months after admission. During the hypnotic sessions the patient believed that the time was just previous to his admission to hospital, there being amnesia from the time of the gassing up till and including the time of the hypnosis. After each session, four in all, he awoke with amnesia for the interviews, and still believed he was David Dawson according to the suggestions. As David Dawson he said that he vaguely remembered about his book, that it was about a man, Alexander M—, with a wife and child, and that the book was a kind of autobiography. He still desired to undertake some form of social service to help mankind, e.g. nursing.

Under hypnosis, as Alexander M— he was given a reasoned explanation as to why he might have assumed the character in his book. It was then suggested to him that he would dream overnight about the gassing incident.

It was further suggested that he would more readily accept any interpretations given and gradually come to realize the true state of affairs. The following type of dream resulted :

" I dreamt that I travelled in a bus beside someone who looked like myself. I went to a London station, and there again there was someone beside me who looked like me. I walked around the streets of M— and then had a confused feeling that I was going to Glasgow. The other person was above me, controlling my actions almost by the use of strings. I was at the end of a rope and the other person was pulling it as if I were a puppet."

In the days that followed he began to doubt the story of David Dawson, and by explanation and analogy he gradually began to realize what had happened until he ejaculated : " But are you suggesting that I am Alexander M—, ? " At this point he was again hypnotized and orientated to this last conversation, which he thought had occurred 2 or 3 days previously. Finally, it was suggested that he would be Alexander M— on awakening and would not be unduly worried over the personality change.

On awakening he remembered having had a quarrel with the landlord, who had threatened to evict him. He had then left for work but never arrived there, having gone on a tour of England and finally arrived at Glasgow. He said he understood his dreams and the implication of the explanations offered him. In the ensuing days he worried about his wife and child but not about his amnesia. When his wife arrived in hospital this worry resolved. She confirmed the story of Alexander M— up till the time he left home. She was not aware that he had been writing a book since he often took home work from his office. She thought he was preparing a speech.

He has, since discharge, returned to his former employment and is still well after six months.

DISCUSSION.

The first obvious indication of mental upset appears to have been a fugue. The term " fugue " is restricted, in accordance with Stengel's definition (18), to a state of altered or narrowed consciousness with the impulse to wander. Fugue states may occur in many conditions—epilepsy, hysteria, schizophrenia, psychopathic states—but Kraepelin (10) recognized early that it was impossible to distinguish between the various states of compulsive wandering associated with the several mental disorders. Schizophrenics not infrequently go suddenly on a journey. " All such incidents when heard of for the first time suggest hysterical fugues, but have a very different significance." (Henderson and Gillespie.) (8).

The hysterical fugue may be regarded as a manifestation of dissociation, of which multiple personality is an extreme example. Repression, on the other hand, is regarded as an element or accompaniment of schizophrenia (13). Both the symptoms of schizophrenia and hysteria, however, may be combined ; indeed, McDougall (13) states that no dissociation takes place without some previous repression which prepares the way for it. In the foregoing case-study we find the actual fugue preceded by a period during which the patient secretly composed his book, the result of an attempt to repress his housing troubles. Claude (3) has described what he calls the " schizoses "—an intermediate group between neuroses and psychoses. He states that the schizoses differ

from one another mainly in the depth and gravity of the dissociative process. In the schizoid type of schizosis the dissociation is lasting, often permanent and final; in the hysterical type of schizosis the dissociation is essentially superficial and temporary.

The fugue is regarded by Stengel (17) as a substitute for suicide. However, in twelve of his cases, suicide had been attempted on one or more occasions. These attempts were not undertaken during the fugue state, but either in one of the periods of depression after the fugue or else during the state of depression independent of the fugue. In another case the fugue state was extended and took on the nature of a purposeful journey. Wilson (20) regards dual personality also as a suicidal compromise. He says that the patient's determination to give up in view of his difficulties is prevented by the emergence of a different personality. Thus in the case under consideration it would appear that the patient endeavoured to escape from his difficulties firstly by putting them on paper under the guise of a novel, then by a fugue, then by adopting another personality, and finally by attempting suicide. By comparison, Stengel records a case of schizophrenia simplex in which fugues occurred during spells of depression associated with vague ideas of reference. Stengel stresses the importance of unavailability of one or both parents as a factor increasing the liability to suicide, and as an aetiological factor found in the development of fugues. In this case-study the patient's father was seldom at home and took very little interest in him and was virtually unavailable. The precipitating factor of such episodes is considered to be trauma—emotional or mental shock (Claude (3), Kanzer (9), LeCron and Bordeaux (12)) and certainly in this case the fugue was preceded by acute emotional upset due to the landlord's ultimatum. Similarly, Copeland and Kitching (4) state that a disinclination to face facts is the prime aetiological agent.

At one period the patient felt as though he were standing apart from his body and expressed feelings of unreality—a state of depersonalization (originally described by Dugas) (5). This condition may occur in schizophrenia or hysteria. It is relatively common, however, for hysterical behaviour, and more rarely psychogenic amnesias, to follow improvement of the depersonalized state. Thirty-two out of forty-two of Shorvon's (16) cases were frightened of their father in childhood, and used various expressions such as "strict" in their reference to him. This occurred in the present case-study. Shorvon considers the preponderance of unsatisfactory parent-child relationship to be significant. The present use of the term "depersonalization" does not conform with the view of Bockner (1), who holds that the absence of ideas of reference is a prerequisite of its diagnosis. He further states that intelligence in such cases is usually above average; this agrees with the findings in the present study. Nielsen and Ingham (14) report cases in which loss of initiative and emotional flattening occurred after carbon monoxide poisoning. How far the clinical picture of David Dawson was modified by the attempted coal-gas suicide remains a matter for speculation.

With regard to the personality changes we have to consider the relationship between the two characters. There is a distinct difference between the normal, sociable, extraverted personality of Alexander M— and the assumed, moody,

introverted personality of David Dawson, in whom emotional flattening was marked. Nevertheless, he gave indications that he was not unaware, at least unconsciously, of the existence of another personality. For example as David Dawson he mentioned that he felt as though he were a puppet, and that someone else was present whom he could not see. When hypnotized he stated that he first realized that he had "wandered" when he was in Glasgow writing his book (i.e. as David Dawson). Further, when describing, under hypnosis, his attempted suicide, he mentioned that he burnt documents prior to the gassing in the hope that someone else would be considered as dead. Alexander M—'s induced dream is also significant in this respect.

Many points of similarity between David Dawson's history and that of the character in the book are evident. In addition, the problems of the true life of Alexander M— are mirrored in those of the hero of his book and that of his assumed personality. It is interesting to note the reaction of the three personalities—Alexander M—, the hero of the book and David Dawson—to three problems:

(a) Alexander M— wished to write. Consequently he made the hero of his book a journalist, and, likewise, David Dawson pretended to his landlady that he was a journalist.

(b) Alexander M— was about to be evicted by his landlord, and attempted to solve the problem by making both the hero in his book and his assumed personality seek the purpose of life, the prerequisite of which was "happy living in a good environment." It is revealing to see that Alexander M— says that a full and contented life can be achieved if we help each other through our difficulties, i.e. his difficulties! but he couldn't see how the hero, David Dawson, would attain that solution at the end of the book, i.e. the solution to Alexander M—'s housing problem.

(c) His attitude to his love-affairs is illuminating. It might have reasonably been expected that Alexander M— would have compensated for the unhappy love-affair with Kath by making the hero of his book more successful in this respect. His failure to do so suggests that there is an element of immaturity in his make-up, since it appears that he did not wish the hero to have a successful love-affair. This is further borne out by the fact that in the book the father of David Dawson was made to die before the mother. Freud (6) has contended that in the aetiology of hysteria an unresolved Oedipus complex can be traced fairly easily in a great majority of cases.

Multiple personality has been induced experimentally by means of hypnosis. Harriman (7) used indirect suggestion to evoke spontaneous roles, thus circumventing any possibility of influencing the subject. Leavitt (11) points to an intimate association between hypnotically-induced multiple personality and the disparate personality resulting from hysterical dissociation. The reversal of the personalities by hypnosis as in the case under consideration would tend to favour hysterical dissociation as the cause. Hypnosis was utilized as a means of uncovering the basic personality with its memories and as a means of restoring it to normality. Hypnotically-suggested dreams facilitated the transformation.

Thus we have a case which would most conveniently fall into Claude's

group of "Schizoses." The hysterical element is suggested by dermatographia, the response to hypnosis, the previous amnesias and the precipitating factor of emotional upset. Further, according to Cameron (2), the hysterical patient retains the ability to exploit his environment: it is likely that David Dawson would have been content to pursue his career in life as a journalist or as a male nurse if opportunity had been granted. The schizophrenic element is suggested by the ideas of reference, the premonitions and the lofty ideals. The poverty of emotional response and the suicide may belong to either category. Cameron states that "people are vague and dreamy in both disorders." Morton Prince (15) refers to the absence of certain instincts in multiple personality. It was claimed both by Alexander M— and his wife that he had never been angry in his life. Referring to such instincts as anger, fear, etc., Prince says, "In every case of multiple personality that I have had the opportunity to study, each phase has been shorn of one or more of these inborn psychopathological dispositions and I believe this obtains in every true case."

SUMMARY.

A case of dual personality with schizophrenic characters is presented. The following features are discussed:

1. The fugue state in its relation to hysteria, schizophrenia, and suicide.
2. The diagnostic significance of depersonalization.
3. Claude's concept of the "schizoses" as a group intermediate between neuroses and psychoses.
4. The differential characteristics of the various personalities as shown in the patient's behaviour and writings. Hypnosis was used as an aid to diagnosis and therapy.

I am much indebted to Dr. John McLeod, Consultant Psychiatrist, in charge of the case, for permission to publish this paper, and for his kind assistance and advice in its compilation.

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PARIETO-OCCIPITAL SYNDROME FOLLOWING CARBON MONOXIDE POISONING.

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SUICIDAL attempts by coal-gas poisoning are very common. Carbon monoxide is a principal constituent of this gas, and can produce severe and permanent brain damage. It is surprising, therefore, to find so few cases of chronic organic psychosis attributed to this cause in mental hospital practice. Rosseter (1928) found only one example of permanent psychosis in 2,000 cases of carbon monoxide asphyxiation. Shillito, Drinker and Shaughnessy (1936) made a follow-up study of 21,000 cases of acute carbon monoxide poisoning. In only 43 of these were the after-effects sufficiently severe to warrant their admission to a mental hospital. Twenty-three subsequently recovered, 11 died, and 9 suffered permanent nervous and mental sequelae. They found that the ratio of psychosis following carbon monoxide poisoning to other psychoses was 1 in 2,000. Henderson and Gillespie (1944) could find only one such case in 5,000 consecutive admissions.

A parieto-occipital syndrome following carbon monoxide intoxication is still less common, and we believe it is sufficiently rare to justify this publication. Among the few cases reported are those of Isakower and Schilder (1928), Stengel (1929) and A. Adler (1944). The case of Isakower and Schilder presented a complex parieto-occipital syndrome which included visual agnosia and Gerstmann's syndrome. Visual agnosia also featured in the cases reported by Stengel and Adler.

Our patient attempted suicide by coal-gas poisoning five years ago. He has been in hospital under observation during this time, except for a few months when he was discharged to the care of his relatives and attended as an out-patient.

He presents a complex parieto-occipital syndrome, which includes Gerstmann's syndrome of finger agnosia, agraphia, disturbance of orientation for right and left, and acalculia, constructional apraxia, spatial disorientation and other disabilities which may be related to these.

CASE REPORT.

General Examination.

I. Admission Note.

J. M. P—, male, aet. 35 years, was admitted to a general hospital on 12 October, 1944, following a suicidal attempt by coal-gas poisoning. When he recovered

consciousness, a few hours after admission, he was vacant and bewildered. He tried to co-operate in the examination, but his replies were irrelevant. He perseverated and showed echolalia. His memory was grossly disorganized, and he was disorientated for time, place and person. When a lighted cigarette was given him he put the wrong end in his mouth. He was doubly incontinent.

After 14 days he was certified and admitted to hospital under our care.

2. *Previous History.*

Birth, infancy, childhood normal. Average intelligence.

3. *Personality.*

Nervous, shy, retiring and over-sensitive.

4. *Work Record.*

He managed his own business as a hawker of vegetables, and apparently made a success of it until 1940. His business then deteriorated owing to war conditions, and he became a builder's labourer. In July, 1944, his nervous symptoms increased with the development of ideas of reference and delusions of persecution. He became listless, depressed and withdrawn. In October, 1944, he tried to kill himself by gassing.

5. *Physical State.*

Asthenic type, of poor muscular development. Physical examination was essentially negative. Examination of the central nervous system revealed no neurological signs; particularly were there no abnormalities in the pyramidal and extra-pyramidal systems. Cranial nerves were intact. Visual fields were normal on confrontation tests. There was no evidence of hemianopic field defect. There was insufficient co-operation for perimetry. There was no evidence of peripheral nerve involvement. Blood Wassermann was negative. Cerebro-spinal fluid was normal in all respects. There was loss of sphincter control.

6. *Mental State.*

For a few weeks he was suspicious, resentful, and expressed persecutory delusions. He tried to co-operate in tests, and when he failed in many of them he became acutely disturbed emotionally and wept. His mood was labile. Within a week of admission he gained control of his sphincters.

During November and December, 1944, his suspiciousness and distress and irritability were replaced by a facile and euphoric state in which he showed little spontaneous activity. His gross disabilities in the performance of tests concerned him less acutely than before, and he weakly tried to minimize or conceal them. His memory was grossly impaired for events, particularly in the recent past, and he showed confabulation. He could not give the correct day, date, month or year, although he made several incorrect attempts. He could not recall a name and address 5 minutes after they were given to him.

Special Examination.

1. *Speech.*

(a) *General.*

22 November, 1944.—There was no alteration in the rhythm and cadence of speech. His utterance of words was not impaired and he had a fair vocabulary. He repeated words correctly after the examiner, including some unknown to him. He understood all that was said in ordinary conversation, and showed no expressive difficulty in spontaneous speech. He was able to sustain an ordinary conversation reasonably well. There was difficulty in word-finding.

(b) *Object Recognition.*

He could recognize and name some common objects shown him but failed with many others which he described by their quantity and use. He recognized the correct name, however, when it was given to him, and he selected objects asked for from a miscellaneous collection.

<i>Object Shown.</i>	<i>Reply.</i>
Pencil	Pencil.
Sheet of notepaper	Sheet of paper.
£1 note	"Money of some kind; it's paper."
Watch	"It's a common thing to me. Is it a lighter of some kind?"
Knife	"Things are so different. I've seen it before, but I couldn't tell you what it is for the time being."
Button	"That's another thing I need. I need it for tying anything up. It is hopeless; I cannot understand it. I've lost control of everything. I cannot even remember that." (When asked if it were a shilling, button, sixpence or a penny, patient replied at once, "a button.")
Ash-tray	Ash-tray.
Cigarette	Cigarette.
Pen	Pen used for ink.
Safety-pin	Needle.
Comb	"I couldn't tell you. It's used for the hair."

(c) *Colour Recognition.*

He could name and recognize primary colours, but made mistakes with some compound colours. (This could result from colour blindness, but his previous history suggested they were agnostic).

<i>Colour shown.</i>	<i>Reply.</i>
Green	Green.
Yellow	Yellow.
Blue	Blue.
Red	Red.
Purple	It could be anything, blue, orange. That's a different colour altogether—red."

He could name the days of the week and the months of the year. In the alphabet he got as far as H and then became confused. He could count from 1 to 20.

(d) *Reading.*

He was unable to read sentences when they were presented to him in large print. He could read some words and numbers shown singly to him. Sometimes he could read part of a word only. When the first syllable of a word he had difficulty with was given him, he could sometimes complete it. For the most part he hesitated, pondered, looked puzzled, and eventually gave up. When questioned about his difficulties, he said he could take a book and see the letters but could not follow it—in his own words, he could not make head nor tail of it. Perseveration interfered with his performance.

<i>Reading presented.</i>	<i>Reply.</i>
Cat	J E R.
Edinburgh	An R, and E and a T.
Hospital	Hospital.
Westhouse	"House at the end; I don't know what is at the other end."
2	"That's only a letter to me."
4	"That's only a word to me."
Cadbury	Perseverates. When given Cad; says "Cadbury."
London News	London News.
Paddy	Brandy.
25	T E O.

(e) *Writing.*

See "Praxis" below.

2. *Gnosis.*

(a) *Visual recognition.*

(b) *Object recognition.*

(c) *Tactile recognition.*

These are dealt with under speech functions above.

This was not impaired for objects he could recognize visually, and there were none he could recognize tactually but not visually.

(d) *Corporeal Recognition.*

He recognized and named correctly all parts of his own body pointed out to him, but became confused about his fingers. When asked to name his fingers he replied as follows :

<i>Fingers shown.</i>	<i>Reply.</i>
L 1 .	R 2.
R 3 .	R 3.
L 2 .	R 4.
L 5 .	R 5.
L 3 .	L 2.
L 5 .	L 2.

3. *Praxis.*

(a) *General.*

He could recognize the use of a hammer and key. He recognized a pair of scissors and knew they were used for cutting. He was unable to use them to cut cloth.

When offered a cigarette, he fumbled with the cigarette case and eventually pinched the cigarette paper between his finger and thumb and took it out. He took a matchbox given him, opened it very slightly, extracted a match, extracted a second match and mumbled, "Now I have got a match, if only I could get a light." He tried to strike both matches together on the back of the box, and, having been instructed how to light the match, he held it between his finger and thumb where it burned right down, whereupon he looked afraid and worried, and did not understand to drop it.

(b) *Dressing.*

The patient's dressing-gown was removed and he was asked to put it on again, whereupon he fumbled with his slippers and ignored the dressing-gown. After repeated orders he picked up the dressing-gown, rolled it up into a ball and put it on the floor. When instructed to put his arms in the sleeve he fumbled with his shirt sleeve and ignored the dressing-gown. When it was held up for him, he put his left arm in the right sleeve and ended up with the dressing gown over his head, and said, "I cannot light a match and I cannot light a cigarette, and I don't understand it."

(c) *Constructional Ability.*

He was quite unable to make squares or triangles with matchsticks or pencils, even when one side was abstracted before his eyes and given him.

(d) *Drawing.*

Similarly, he could not complete drawn figures even when a copy was beside him and he had to fill in one side only. With matches, and in drawing, he made many movements but did not succeed in closing the gap. He could not replace the abstracted match from three in line.

(e) *Writing.*

There was gross disability and he could write nothing decipherable. He tended to make a series of strokes close together and sometimes one on top of the other. On a blank sheet of paper he crowded his efforts in one small portion, often at the edge of the paper.

(4) *Visual and Spatial Functions.*

His performance in dressing, writing, reading, construction and drawing might well have been included as defects of spatial function. His own comments are relevant: "I'm not as I should be. I cannot find my way around. I go the wrong way. I cannot even get to my own bed. I have to get someone to show me how to lie down on it." He lost his way in the wards and corridors. When lying down he put his feet on the pillow, and his head at the wrong end of the bed. There was a tendency for him to confuse left and right, and in front and behind.

(5) *Counting and Calculating.*

His ability to do simple calculations was grossly impaired.

<i>Question.</i>		<i>Reply.</i>
2 + 6	. . .	2 + 6, and 6 and 3 and 6 and 4 and 6.
2 + 6	. . .	7 isn't it?
2 + 2	. . .	4.
4 + 2	. . .	6.
6 + 2	. . .	8.
2 + 6	. . .	4.
10 - 3	. . .	8.
4 × 5	. . .	7 and 4 + 5 and 45.

Progress.

1946.—

All the disabilities above mentioned were present. His mood was mildly euphoric but was very labile, and he showed despondency with weeping and irritability. He had become familiar with the topography of the ward and could find his way about there alone. His reading and his ability to recall names was better. He could now undress himself but he could not put his clothes on. Occupational therapy had been intensively carried out, but his response was extremely poor. He was able to go out with his visitors.

1947.—

(1) *Speech.*

There was a definite improvement in word finding, reading and dressing. He seemed to tire less easily and was more accessible to examination.

He recognized and named most of a selection of common objects, and his performance far surpassed that of four years previously. With colours he continued to describe compound ones by their dominant components.

<i>Objects shown.</i>	<i>Reply.</i>
Buckle . . .	"Made for a strap."
Drawing compass . . .	"A gauge."
Drawing-pin . . .	"A pin for sticking in the table."

Reading.

His difficulties in this direction became clearer. He was able to read printed matter and handwriting fairly accurately, but slowly and word by word. Many polysyllabic words defeated him. He had difficulty in switching from the end of one line to the beginning of the next. He confused letters similar in form. For example:

Q and G, F and E, M and W. Thus, he reads "lime" for "line," and "mice" for "nice." He made similar mistakes with handwriting. He read simple integers and numbers with two figures correctly but with hesitation.

(2) *Gnosis.*

His body agnosia remained confined to the fingers.

<i>Fingers shown.</i>	<i>Reply.</i>
Little finger . . .	"Main finger or thumb."
Index finger . . .	"Middle or right."
Ring finger . . .	"The bing finger, or the second."

(3) *Praxis.*

Left alone, and given time, he succeeded in dressing himself correctly, except for his tie. If hurried, he put on his shirt before his undervest, and his jacket before his waistcoat. He could, however, carry out some fairly complex actions which did not involve accurate placing.

His constructional drawing and writing disabilities were as gross as before. In writing he would attempt nothing but his own name in block letters. Thus, for "John" he wrote "I O II II." At occupational therapy he made simple purses badly by threading a thong through punched holes which had been started for him. He was able to do only 5 or 6 holes per hour.

(4) *Visual Spatial Functions.*

He could easily get lost, but he could now orientate himself correctly on occasions by identifying a landmark. He could however, estimate distances reasonably accurately by use of his hands, and when five cigarettes were stood upright on a table he was able to give their order, from the closest to the furthest from him, and to say which two were closest and which most widely separated.

(5) *Discharged Home (1947).*

At home he made a poor re-adaptation to his life. He seldom joined in conversation or did any work spontaneously. He spoke when spoken to, and performed some very simple tasks to order. Against medical advice he was allowed out alone and, it seemed, made his way from his mother's home to that of his sister, two miles across the city, without mishap. He took some hours for the journey, and arrived saying he had walked a long way, and appeared very exhausted.

He dressed himself, but was careless of his appearance and was reported to require as much attention as a little child.

Readmitted 1948.

He was returned to hospital because of the failing health of his mother and because he had no idea of money. In shops he gave a penny instead of a shilling, and argued when asked for more.

On readmission his defects were essentially unchanged. They evoked in him nothing approaching a catastrophic reaction, and he excused himself lamely and tried to laugh them off. He was facile and euphoric, and was delighted when he answered correctly. There was, in fact, an awareness of his defects in some measure but no real distress.

COMMENT.

The main purpose of this communication is to record the clinical features and course in this case. On the basis of such an isolated example, and in the absence of pathological studies, we do not presume to speculate on the possible functional inter-relationships of the various disabilities. There are, however, a few aspects of the mental and neurological sequelae that we should like to discuss briefly.

Onset.

In attempting suicide by carbon monoxide poisoning death may occur in the state of acute intoxication. Most patients who survive this recover completely. In a few evidence of brain damage persists in a chronic form. In the material surveyed by Shillito *et al.* such sequelae never followed chronic exposure to the gas over long periods of time, and it is likely that intoxication with unconsciousness is a necessary precursor.

A commonly described sequence of events is that in which the acute phase is followed by a lucid interval in which recovery seems to have taken place. In a few days, or a few weeks, however, clinical evidence of brain damage becomes clear. Attention was drawn to this possibility by Kraepelin, and Shillito *et al.* found that in one-third of their cases which later showed organic defects there was an interval of mental clarity which lasted from 7-20 days. In our case the acute and chronic phases merged imperceptibly one into the other, and as far as we know, none of the published cases with parieto-occipital syndrome have shown a lucid period.

Clinical Manifestations and Pathology.

The literature on the residuals of carbon monoxide poisoning is extensive, but much of it concerns the clinical features and the neuropathology in these cases which die in the acute intoxication or survive for only a few months. The characteristic pathology consists of bilateral pallidal softenings, together with similar lesions, often widely spread throughout the cortex and white matter (Mott (1907), Stewart (1920), Wilson and Winkelman (1922), Grinker (1926), Sayers and Davenport (1936), Raskin and Mullaney (1940)). The symptomatology is varied, but a Parkinsonian syndrome is common. In some cases there is evidence to indicate involvement of the cord, and peripheral neuritis has been described. The literature is reviewed in some detail by Raskin and Mullaney, who recorded a case in which a mental picture of involutional melancholia was combined with a Parkinsonian syndrome. This patient survived for 15 years. Bilateral pallidal lesions were found post mortem.

Our case showed no pyramidal or extrapyramidal signs. The outstanding defects were "focal symptoms," including Gerstmann's syndrome, spatial disorientation, constructional apraxia, dressing disability and minor degrees of nominal aphasia and alexia.

Although we are unable to make precise statements about cerebral localization, there is ample evidence to indicate that such symptoms are related to a lesion of the parieto-occipital areas.

Riddoch (1917) and Holmes (1918) described spatial disorientation with damage in this area, while Gerstmann's syndrome and constructional apraxia have been correlated with similarly placed lesions (Kleist (1922), Isakower and Schilder (1928), Stengel (1929), Mayer-Gross (1935, 1936), Neilsen (1936, 1938, 1940)). Gerstmann's syndrome itself is generally believed to depend on a lesion at the border of the angular gyrus and the second occipital convolution of the dominant hemisphere. Brain (1941) has described two cases of dressing disability with a lesion of the left parieto-occipital lobe in one, and the right parieto-occipital area in the other, and Hemphill and Klein (1948) found dressing disability and spacial agnostic defects with involvement of the right non-dominant parieto-occipital areas in two cases. Stengel (1944) has suggested that the combination of Gerstmann's syndrome and constructional apraxia with loss of spatial orientation is the result of bilateral lesions of the angular gyri, while the intact right angular gyrus permits only a part of the syndrome to become manifest, i.e. constructional apraxia or Gerstmann's syndrome

together or alone. In our case we believe that a bilateral lesion is more likely than one confined to a hemisphere, because the lesions resulting from carbon monoxide intoxication are usually symmetrical.

We are not sure to what extent there may be involvement of the frontal lobes. The general disturbance of character with lack of initiative and with euphoria could, we think, be attributed either to frontal or sub-cortical damage.

Course.

The course of the illness in our case confirms the general view that symptoms of this kind following carbon monoxide poisoning, improve only slightly. A general mental deterioration occurred rapidly following the initial few weeks when the patient was painfully aware of his deficiencies. A vague awareness of defect persists, but for the most part he is indifferent to his gross and permanent disabilities.

In a final assessment of the total clinical picture and its course, we think it likely that the pre-psychotic personality and the original illness which was responsible for the suicidal attempt may have contributed to the complexity of the syndrome and to the rate and extent of the mental deterioration.

SUMMARY.

1. A complex syndrome which includes spatial disorientation, constructional apraxia, Gerstmann's syndrome and dressing disability has been described, following carbon monoxide poisoning.
2. It is considered that a bilateral parieto-occipital lesion underlies the main symptoms.
3. There was no lucid interval following the stage of acute intoxication.
4. The case has been observed for five years. Mental deterioration came on early, and has persisted. The total improvement has been slight.
5. Brief reference has been made to the relevant literature.

We are obliged to Professor Sir David K. Henderson and Dr. W. M. McAlister, O.B.E., for allowing us to observe this case, and to Dr. E. Stengel for his help in the initial examination.

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OBSERVATIONS ON ELECTIVE MUTISM IN CHILDREN.

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THERE is a distinct variety of mutism in children which Tramer (6) and others call "elective," i.e. partial, occurring *vis-à-vis* certain persons only. The children are "sensitives" in Kretschmer's sense, i.e. they are timid, shy, susceptible to teasing and irony, and come from an insecure milieu; the abnormality is often familial.

The Case of William.

A typical example of elective mutism is the case of William, aged 7 years, referred by his headmaster, because he never speaks to his teacher.

A similar disorder exists in another member of the family. The boy's grandfather goes about for prolonged periods without speaking. He will, for instance, go into the village post office-cum-general store, thrust half-a-crown under the grille, speechless, and when given in exchange the wrong thing, he just pushes it back and waits for the next offer, till finally the purchase is completed to his satisfaction.

There are 7 children between 1 and 12 years, William being the youngest of 5 boys, succeeded by two small sisters. No physical or mental disorders have been reported in them. According to the information from his mother, she had no difficulties with the patient when he was a baby. He was breast fed till 3 months of age, later bottle fed, and he thrived on both. The usual landmarks of development were reached at approximately normal times. He walked at 1 year, talked at 16 months. Teething and toilet training were normal. He was a contented baby, but at 3 years he stopped speaking to strangers, and has never spoken to any since except as detailed below. He started school at 5. At first it was difficult to make him go, but he finally settled down to it.

His mother says he will not do what he is asked to do. He will not even answer at table. He does not try to please his parents in any respect. He plays with other children, and talks and also fights with them, but, she adds, is not the instigator.

He often goes for a fortnight without speaking, but they think nothing of it as he has always been a "funny" boy. He will never talk if approached with questions, but speaks to his brothers and occasionally to his parents. An uncle reports, however, that William stayed with him for two weeks and spoke normally.

Mother thinks that he is a happy child. He is very destructive at home, but, she says, her other boys were worse. William sleeps well, has no nightmares; he is sociable, and particularly fond of one of his brothers. She also related that when she was pregnant with William she had wanted a girl, but it turned out to be a "big boy."

In order to evaluate these statements we have to consider the mother's and also the father's personality and the social background.

The father appears a rather ordinary person without manifest abnormalities, quite intelligent, but of variable co-operativeness and attitude to the Clinic. He works on an estate as an agricultural labourer. The cottage in which the family live belongs to the estate. It is neat and clean although poorly furnished, and in beautiful surroundings.

The mother is a thin, wiry-looking woman; was obviously good-looking in her day. She is neatly dressed and very decided in her views. She talks a great deal

and seems to harbour a grudge against society. She is not in the least co-operative. She thinks we should not be able to do anything for the boy. Hence, she says, she was unwilling that the boy should attend the Clinic. The father, on the other hand, was anxious that the boy should do so.

Thus much for the initial interview. Later on it appeared that the Clinic was made a good pretext by the parents for quarrelling with each other. It was arranged that the boy should be conveyed to the Clinic from the school for a few times in order that it could be determined whether he was suitable for treatment. The mother still refused to accompany him.

Later it was possible to study her in a strange environment. She came to the Clinic in a rather aggressive mood. Though quite polite, she was very definite now that there was nothing whatever wrong with William, and she had no desire to let him have treatment. The P.S.W. and the doctor advised her to take him home without investigation if she felt that way. Shortly afterwards she re-appeared saying that her husband had seen the headmaster, and they had decided to let the boy have treatment. She was much less aggressive than before, but not very much material could be elicited from her, except that William was quite pleasurably excited at the prospect of coming to the Clinic. About her marital relations she had to say that the father was quick-tempered and not easy to live with, but he is interested in and helps with the children. William's behaviour was discussed with her, and it was pointed out that his condition was a disorder which should be treated at home with forbearance.

In the meantime *the teacher* was asked to observe William in the playground when he was with other children. He reported that the boy played with them but did not speak. Perhaps this was due to the teacher's, if distant, presence. At other times he was observed by ourselves speaking to other children. The teacher furthermore reported that the boy gave him trouble by kicking and screaming whenever he was asked to do something in class. Also the other members of the family who are at the school cause trouble except the one brother William is specially fond of, as remarked before. When one of the children is involved in a row, William will get up and join in by kicking the teacher. This behaviour had continued for some time till finally the teacher thrashed William. At present he seldom causes trouble at school, but still refuses to use pencil or chalk. Occasionally he writes numbers in his book, but not those that are being written on the blackboard for the pupils to copy. He is now due for promotion according to his age, but this would mean moving him to the same classroom as his brothers and the teachers are afraid of renewed outbursts.

The headmaster and the class-teacher consider William's as an urgent problem, as he is not able to benefit at all from the education provided for him. The opinion was formed by the psychologist and the P.S.W. who visited the school that the staff were exceptionally good and understanding, and that they had made a real effort to deal with the child's difficulties before they referred him to the Clinic, and that they were still keen on helping as far as is in their power. The teachers also considered the whole family as difficult and in need of help.

On examination *the child himself* appears physically healthy. Apart from measles at 4 he had never been seen by the doctor. He is a stocky, thick-set boy with facial features vaguely reminding of the mongol. He is flat-faced with black straight hair. His eyes are small and slanting, his mouth almost continuously open. His tongue is big, his limbs are short, his fingers broad, and especially his thumbs and middle fingers very short. The hand lines appear normal. He is very muscular for his age. There is no outstanding clumsiness, and his gait is normal. His motor co-ordination is satisfactory, his movements appear rather slow, but not uncertain. His facial expressions are adequately responsive. But it is noteworthy that he compresses his lips when speech might be expected. This appears typical for his condition, and has been observed in other cases. He eats and sleeps well, and he is, according to parents' and teachers' reports and the school doctor's examination of his general state of health, normal in every respect except speech. The school medical officer is of the opinion that there is no deafness, disease of the speech organs or other specific somatic abnormality. There is no history of brain or other nervous disease or injury. But thorough examination was impossible at our Clinic owing to the child's unco-operativeness. It was also impossible to give him tests of intelligence, of aphasia, etc.

When he came to the Clinic first William cried, screamed and struggled. He

was sent to one of our play groups. After a time he cried quietly but still refused to play. When the crying had stopped he was given the Terman and Merrill intelligence test, but he never answered a question. A further attempt was made to interest him in the cubes and toys of the tests, but this also failed. He refused even to touch the material. When he was handed a toy he made no move to grasp it. If it was pressed into his hand he would hold it only so long as his fingers were held round it. As soon as the grip on his hand was relaxed he dropped the toy passively. He was tried with the board form of Raven's Progressive Matrices, and got as far as fingering the pieces but never attempted to place them. His ability to obey commands was tested by telling him to do things he might be presumed to be wanting to do: for instance, he was told that if he were to open the door he would be accompanied back to school at once. On such occasions the "command" was obeyed promptly. Further tests in obeying commands brought about a completely recalcitrant attitude. For example, when asked to open his mouth he would press his lips so tightly together and grip them with his teeth as to turn them white and bloodless.

We could demonstrate by recording his voice when he was at play alone with his brother that he spoke to him, if only in monosyllables. We have also heard him say "Thank you" to the P.S.W. when offered two pennies as a present, if he did say "Thank you," whilst he refused to say so for one penny. Reports that he swore fluently in the village were also verified.

The teachers' and parents' reports of William's conduct on various occasions confirm our observations in the Clinic, which suggest that the boy is not defective. In the absence of formal testing results an accurate estimate of his intelligence is impossible, but we have the impression that he may not even be dull.

Progress of treatment.—As mentioned before, on his first visit patient screamed, cried, and kicked the floor. He was taken to the playroom in the company of other children, but refused to take part in the games. This sort of behaviour continued for about a month. After William had been conveyed to the Clinic five times he still did not speak, but was very much more co-operative, although he still occasionally struggled and repeatedly screamed when he was to leave the car on his arrival at the Clinic. But he also blew the horn with alacrity, and formed an attachment to the play supervisor and the P.S.W.

For the next period there was no crying, but he still refused to take part in the playroom activities. During this time a number of visits were paid to the school, but little sign of improvement was noticed there. This state continued for about six months. By that time William could be coaxed into answering questions, if in monosyllables, but he talked only when the answer was suggested. The approach was changed then, and other children were instructed to draw him into the games. No adult took any notice of him at this time. It was noticed then that he spoke to the other children in whispers.

When no further progress seemed to be likely to develop the psychologist took on William and one other child together. The psychologist played some game with this one child. William was free to take part in the game, and was always invited and given his turn to play, but the game went on whether William joined in or not. In about a month William began to reach for the play material himself, counted his score, noted who had won and who had lost. He would now discuss the game with the psychologist. He began also to describe some drawings comparatively freely.

Since attending for almost a year he has produced one or two drawings, one of a tractor and a road roller going towards a little child whom he identified as his baby brother. This was taken as an expression of sibling rivalry. He often produces scribbles. He is somewhat improved, is less recalcitrant, sometimes joins other children in play, but rarely speaks spontaneously. Occasionally he may make monosyllabic whispered replies to questions addressed to him by other persons than the psychologist. On one occasion, quite recently, he drew what vaguely resembled a lorry. When he was praised for it, and asked what it was, his reply was misinterpreted as "lorry," but he was told it did not quite look like one, and a lorry was drawn for him as a model. He became angry and said "You are daft," and went on in this vein for some time, and finally it came out that what he had drawn was a "tractor." But a similar sustained performance has not been recorded since. Quite recently he has begun to talk freely at home, also to strangers, but continued as yet to be mute in school.

Other Cases of Elective Mutism.

In view of the rarity of elective mutism it may be permissible in the following to quote at length extracts from other case reports.

In my own experience of more than an estimated 500 child guidance cases, I have come across only one before the reported one. The *little girl* in question, 7 years of age, had an I.Q. of between 170 and 190, according to performance tests—the only tests that could be applied owing to her condition—she spoke spontaneously only to her school mates, occasionally to the headmistress and to her mother, but did not speak to her father or siblings, who were practically grown up. After 6 months' regular interviews once a week she began talking to me, and after a year she had so much improved that she spoke to most people, if reluctantly. There was no hereditary tainting, she got on well at school, and apart from maternal over-protection, which may well have been secondary, and apart from being the youngest of the family, no relevant points suggesting psychopathology were discovered. She was certainly "sensitive" in the above-defined sense.

The following is a short account of *Dr. Ruth Sandeman's case*. He was referred at the age of 10. His I.Q. was in the region of 115. In spite of his refusal to speak he was expected to qualify for a scholarship. He stopped speaking at three, except to father, mother, both grandmothers and an aunt and possibly one little girl. The children at school knew he could talk, but was thought not to do so even to them. He had had treatment since his fifth year, and had said two or three words to one of the therapists once.

On one occasion he was hypnotized without success. He had also a long Freudian analysis. He had it all pat that he stopped talking when he saw his father's artificial leg in the wardrobe when aged 3—this was verified—because he thought his mother had bitten the real leg off. During the interviews he produced plenty of humour of a rather cruel type. He was most frighteningly sadistic. He always talked with the doctor and also wrote and drew. He enjoyed a carpentry class he was sent to. It was suspected that many of the cruel things he said were quotations from his father. The mother proved none too co-operative. A more superficial aphonia existing besides the real difficulty was at once successfully tackled, but it was felt that the real problem remained unsolved.

The following case reported by *Tramer* ((6) and (7)) was that of a *boy of 8*. There is no significant heredity. His mother has been described as a shy child, but she was not shy at school. His five siblings had always been shy, and showed partial mutism, but less pronounced. They had improved at the age of 3 or 4, and the condition terminated before starting school. The patient had been shy since he was a little child. Walking at one year, talking at 2; toilet training normal. Since his seventh year he has been going to school, but does not talk during lessons or outside lessons to the teacher. He talks, however, in unison with other children, if there are more than two or three. During the intervals he talks to the children and is very outgoing. He likes school and is interested in it, and does his written work well. At home he talks about school and professes to like the teachers. He does not talk to his relatives, and does not accept presents from them. He talks to his father

but not to other adults, but he does so to children and young people and is friendly with them. It took a year before he began talking to a lodger. He does not appear afraid of people or animals, and is said to be affectionate and obedient.

On examination he appeared normally developed physically; there were no medical findings. Judging from his writing and drawings which he does when requested, he appears normally intelligent; also his manual dexterity appears normal. His movements, however, are slow. During the examination he could not be induced to talk to the doctor. Looking at a picture book, he could not be induced to turn the leaves. If one was put into his hand, he would turn it over when told somewhat peremptorily "Now." He looked at the whole pictures, whilst at first he would only look at one detail at a time, and this only when the different parts of the picture were described to him. But he would not spontaneously turn over the pages. The same initial inhibition was observed in connection with other actions. He seemed unable to make a choice. This could only be overcome twice; asked whether "M" or "N" came after "L" he wrote spontaneously "M." He could at last be induced to do a drawing, which, however, did not reveal anything significant. He solved correctly arithmetical problems, but could not be induced to say "Yes" or "No." He was allowed to play with a torch. This was manifestly pleasurable to him, and it appeared that he suppressed his impulses to talk and allowed himself only mute lip movements. No psychological trauma could be discovered.

From the history given by his intelligent mother the following preliminary diagnosis resulted: A heredo-familial pathological fixation of a very early infantile form of reaction towards adults; a conditioned inhibitory reflex going back to the first year of life. Recommendation: Hypnosis, which for external reason could not be implemented; and temporary change of milieu by sending him to a holiday camp with his own teacher.

One year later he was seen again. His elective mutism was unchanged. When asked by the teacher to read or talk he would first blush, then sigh several times and blink his eyes anxiously. This would begin as soon as his neighbour had to start reading so that he knew it would be his turn next. At home he continued to behave inconspicuously but shyly towards strangers.

Entering the consulting room he smiled this time, stiffly stretched out his hand for a shake, produced the hand only very slightly, the arm in stiff adduction. He did not talk, but carefully observed all the doctor's movements. It appeared that his inhibition was slightly improving; his movements, however, were decidedly stiff. His arm when lifted by the doctor was kept in position, although it was apparently difficult for the patient to do so. His face was immovable except for the rotation of his eyes. When asked to write he reacted only when given specific orders what he should write. He complied with a request to draw; his drawings were childish, but bigger and opener this time. When asked questions he repeatedly gulped and blushed. His intellectual progress seemed normal.

Three years later his teacher described him as a good, industrious and very vivid pupil. He showed no shyness and there were no complaints.

Mother reported that he had never relapsed, went on errands and was free from shyness towards strangers. Asked for the reason of his previous silence his mother could not obtain any information from him, and he told the P.S.W. that he did not know. He looked healthy and vigorous, and was perfectly polite towards the P.S.W., free and easy, and talked without hesitation.

Tramer (6) also describes the case of a *boy of 5*, the second youngest of 12 children. There was no heredity: one brother learnt to speak only at the age of 4, the patient himself at 2½. Toilet training was completed only at the age of 5. Walking and teething were normal. He always was different from the other children, and quarrelsome with them. He showed many compulsive symptoms. Sex play with other children was observed. He talked to mother, but very little to father and other children, unless he knew them well, to the doctor only in the mother's presence, and could not be bribed to do so. At the age of 7, after a short time at school, he did not talk to the teacher, nor did he reply to any questions. Outside school he talked with his school friends, and also at home, and was a very vivid child. On examination he was at first typically mutistic. He made speaking movements in response to approaches, but they were rudimentary, and did not result in speech. He was promised a coin if he said what it was, and this broke the mutism. Now he replied, but with inhibition and interrupted by typically mutistic symptoms. Only partial contact could be established. Intelligence, as far as assessed, was low-normal.

Heuyer and Morgenstern (quoted from (6)) relate the case of a *boy of 9½ years* who had started speaking at the age of 4, was mentally defective and suffered from enuresis until he was 8 years old. At the age of 5 his partial mutism changed into total mutism, but he continued to communicate by drawings. The authors claim that the cause of the disorder in this case was castration anxiety.

DISCUSSION.

In discussing our own case we have to consider various possibilities of diagnosis.

If a child does not speak it is necessary to determine whether the behaviour is within the limits of normality, i.e. would a normal child of his age under comparable conditions talk or not.

Aphasia (rather than "mutism" or "aphasia") is to be considered "normal" in children as old as three or four years. They may be intelligent, hear well; they may be neither over-protected, nor suffer under parental coercion and acquire all other psychological functions normally (Kanner, (3)). Often they suddenly start talking, to everyone's astonishment, in whole, well constructed phrases, and display a wealth of vocabulary which they have silently acquired.

Kanner (3) attributes great importance to parental attitudes in the establishment of mutism. "I have seen children whose silence is a part reaction to parental coerciveness," and quotes H. C. Schumacher as saying: "In certain susceptible children forceful attempts to make them conform may lead to mutism . . ." In these instances we may find a combination

of "sensitive" traits and rebelliousness, the latter often being a symptom arising from a reaction-formation to the former.

Our case is clearly abnormal. The absence of signs indicating a lesion of the nervous system, the sensory apparatus and the organs of articulation and phonation, his occasional speaking, and the undoubted capacity for understanding the spoken word and executing certain commands, makes it almost certain that an organic lesion is absent. Also his intelligence level certainly does not explain his mutism. It appears that the crucial factor is emotional, and that the other relevant functions that if impaired might give rise to mutism are essentially intact.

Spieler (5) distinguishes the following types of (psychogenic) mutism: the hysterical, elective, thymogenic and ideogenic varieties. Schizophrenic should perhaps be added to this list. In hysterical and schizophrenic mutism the child will speak in an emergency, and so possibly simulate partial or even "elective" mutism. Kanner says with regard to mutism in childhood schizophrenia and infantile autism: "The patients do not talk because they are so detached that they have no need for verbal or other communication." Some of these children who had been mute all their lives amazed their parents by uttering well-adjusted and well-constructed sentences in emergency situations. But in childhood schizophrenia, in which may be included dementia infantilis, hyperkinetic disease and dementia praecocissima, there is a total disorganization of behaviour at all levels of integration (Vernon Kinross-Wright (4)). Partial mutism may occur in childhood schizophrenia, but it is accompanied by other characteristic changes, like withdrawal, loss of affect, catatonic features, deterioration of habits, etc. In dementia praecocissima there are found, besides the speech disturbance, depression, affective poverty, autistic manifestations and phonographism. In dementia infantilis there is an especially rapid and profound impairment of speech which proceeds almost to complete loss of speech via stuttering, echolalia, indistinct speech till only a few phrases remain. In hyperkinetic disease there is aimless and persistent hyperkinesis following any stimulus, lability of mood, negativism and perseveration, besides a disturbance of speech development. These diagnoses can be safely regarded as inapplicable in our case.

In *hysteria* the duration of mutism is measured in weeks or months and other hysterical symptoms will be present. Waterink and Vedder describe "*thymogenic mutism*," in which all other hysterical symptoms except mutism are absent. It may be doubted whether there is such an entity. "*Ideogenic mutism*," also recognized by these authors and others, is a condition in which the patient imagines that the organs of speech are diseased. Actually there may or may not be an accompanying disease of these organs. These conditions have to be rejected as a diagnosis in our case, as the child did speak though rarely, and now frequently does speak. Most cases of elective mutism show certain common features. The onset is about the same age, between 3 and 5 years. There is no mental defect. There frequently seems to be a familial factor. There is relatively great resistance to treatment, although usually some improvement results. We may be inclined to suspect an early somatic psychological or compound trauma.

According to Jaspers (2), speech, besides its function as a means of communication and a tool for thinking, is a creative act (Werk). As such, it is, apart from its content, an expression of the psyche. We understand elective mutism as an unwillingness to make the effort of speaking under certain conditions. It is a quasi-aboulie symptom. Some psychoanalysts have alleged that the "mutism" of babies is based on a psychological protective mechanism. It is too "dangerous" to speak. Without being able to agree with this it may be thought that elective mutism, directed towards certain persons only, is a *protective mechanism*. Shyness combined with speech blocking in the presence of strangers, especially adults, is a normal early infantile trait. As an exaggerated form of this reaction a pathological fixation of this kind of shyness may come about. It is a form of archaic defence retained abnormally long. On this may come to be superimposed as an aggravating factor which reinforces the retention of shyness, an active contrariness. It is important in this connection to remember that the more passive understanding of speech normally develops earlier than the active use of speech. Children suffering from elective mutism are not arrested at, or regressed to, a stage in which there is no understanding of speech.

In our case practically all the pathognomonic signs exist. There is some hereditary tainting. The child is "sensitive," not defective; he understands; he speaks only to certain people, apparently according to order of apprehended "danger" a person may represent. The home background is insecure and partly hostile-rejecting. There is, however, no evidence of a trauma, somatic or psychological, which may have triggered off the symptom. Sensitivity and insecurity, combined with the handicap of dullness, not amounting to defectiveness, are quite capable of producing the necessary fear which leads to mutism towards "dangerous" persons. Whether the disorder is based on a constitutional retardation of the normal development of speech or on a psychological trauma (or perhaps on a continual traumatic situation and the reaction to it) is difficult to determine. Probably this, like other cases of elective mutism, has these two components, the relative strength of which may vary in different cases. While the psychogenic factor may be quite amenable to treatment, the constitutional is not so accessible. In our case the constitutional and developmental factor seems to be of secondary importance. It appears likely that further spontaneous slow improvement will occur with progressing development, although we feel that in view of the unfavourable family situation and heredity it is likely that considerable residues will persist.

SUMMARY.

Our own, and several other cases of "elective mutism," a relatively rare disorder, are described. The children thus afflicted are "sensitives," often constitutionally predisposed, and come from an insecure milieu. The disorder has to be differentiated from other disorders in which partial mutism may occur. Elective mutism can be understood as a fixation at an early infantile level, on which an apprehended danger situation is met by a refusal to speak.

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A CASE OF RECURRENT PSYCHOSIS ASSOCIATED WITH AMPHETAMINE ADDICTION.

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ALTHOUGH psychotic attacks following overdoses of amphetamine are well known, the following case is reported because it appears unusual in that repeated attacks of mental illness, over a period of several years, have occurred following the ingestion of this drug.

CASE REPORT.

The patient is a Doctor of Philosophy, aged 38 years, and an only child of upper middle-class intellectual parents. Brought up in a strictly moral and religious home atmosphere, his early emotional development showed a deep attachment to his mother, which remains one of the prominent features of his adult affective life.

The first sign of personality deviation became apparent before graduation, in the occurrence of syphilophobia which has persisted in varying degrees ever since, becoming accentuated and interwoven into his delusional pattern when under the influence of amphetamine.

At the age of 27 years he married, in spite of considerable parental opposition to the lady of his choice, and divorced her a year later on the grounds of desertion.

As a refuge, perhaps, more than anything else, he commenced at this time to write a historical treatise. Employment of an academic type was continuous until the age of 32, when, to overcome the fatigue and lassitude involved in correcting large numbers of examination papers for a Correspondence College, he commenced to take amphetamine sulphate 10 to 15 mgm. daily, under a medical prescription. This routine continued for 9 months, until his admission as a certified patient to a provincial mental hospital, with the diagnosis of acute mania.

The main features reported at that time were excitement, noisiness and rambling conversation. Within a week he had recovered from this episode and was discharged to the care of his parents.

During the following 6 years he was admitted on 16 occasions to various mental hospitals throughout the country, either as a voluntary patient, under a 14-day Order, or certified. The clinical picture recorded, common to each admission, with one exception, was wild excitement, confusion, distractibility and marked paranoid delusions. Only once was there an exception to this pattern, when he was extremely depressed, but on this occasion the admission took place more than 7 days after the ingestion of the drug.

Each entry to a mental hospital had been preceded by the ingestion of large quantities of amphetamine, a fact which had been noted in the reports of at least six of the hospitals concerned, and, in addition, we have been able to verify this by personal observation on two occasions. Hallucinations were never recorded, and in each case the maniacal phase cleared within a week. He was admitted to the Pastures Hospital in May, 1949. When first seen he was mildly elated, garrulous

and overactive, eager to impress his intellectual superiority on those about him, and his ideation was mildly paranoid. He was able to give a coherent account of his movements prior to admission. There was no confusion, disorientation, or hallucinosis present, and no abnormality was discovered on physical examination: Blood pressure, 120/90.

He stated that he had failed to obtain a position for which he had been interviewed a short time before; that this had made him very depressed and despondent, and that in order to overcome these feelings, and those of inadequacy, he had taken amphetamine.

Within a week of admission he had recovered sufficiently well to be placed on parole, but two weeks afterwards he absconded from the hospital. He was readmitted 3 days later, on a 14-day Order, and found to be excited, voluble, and suspicious, accused the nurses of attempting to poison him, and expressed numerous other paranoid ideas, although he adopted an ingratiating manner to those to whom he was speaking. In his pockets he had numerous lengthy letters of a manic type, and also the torn-up contents of a benzedrine inhaler. No abnormal physical signs were noted. He stated that he had purchased a benzedrine inhaler and had been nibbling at the contents for several days. Subjectively he complained of loss of appetite, abdominal discomfort, prickly heat in the head and scalp, soreness of the mouth and throat, low backache, and nightmares, the content of which was mainly taken up by mental hospitals and fears of certification. Mild sodium amyltal sedation was given, 3 gr. *t.d.s.*, and a week later he was quieter, had adopted a rather self-effacing manner and showed mild ideas of guilt and shame.

During this period, the opinion formed from clinical examination, that no intellectual deterioration had occurred, was supported by standard tests such as the Mill Hill Vocabulary Scale (Form 1 Senior), Raven's Progressive Matrices, and the Cattell Intelligence Test (Scale 111, Form B), on all of which the score was above the 95 percentile point mark.

E.E.G. examination was carried out on three separate occasions, preceded by ingestion of amphetamine sulphate, 10 mgm. in the first and second, and 20 mgm. on the third. Dr. Grey Walter kindly reported on these recordings, to the effect that there were slight changes in the alpha frequency, but that it was impossible to say whether these were significant or not. They consisted mainly of a reduction in the amount and amplitude of the rhythm.

The mode in which he took amphetamine changed from the tablet form when he discovered that a much larger dose was available in inhalers containing 325 mgm. At first he extracted the drug from the impregnated papers within these by chewing, but ceased to employ this method of administration following the development of severe oral inflammation, and changed to the extract obtained by immersing the papers in either tea or coffee and drinking the solution. The most he claimed to have taken by this means is the contents of two inhalers in 24 hours, i.e. up to 650 mgm.

This patient remained free from psychotic manifestations for 6 months and, having obtained a responsible position for 4 months, continued to give complete satisfaction to his employers until he resorted to the drug once again, following a period of stress in connection with an impending public appearance.

COMMENT.

This and previous cases reported, in which psychotic states have been produced by amphetamine, suggest that it does not produce a typical psychosis, but rather accentuates and activates latent prepsychotic traits in the personality.

Young and Scoville (1938) report that during the treatment of two patients for narcolepsy, paranoid psychosis developed, and they go as far as to say that, if paranoid trends are discovered prior to administration of the drug, it should be withheld.

Shorvon (1945) describes a case of a psychopath in whom a depressive illness was precipitated by amphetamine. His previous personality, as des-

cribed by his friends, was that of a "persistently unhappy man"; there was a family history of psychopathy.

Norman and Shea (1945) discuss a case of acute hallucinosis produced by amphetamine in a man who was taking a daily dose of 250 mgm. His previous personality showed an oral erotic pattern of behaviour, with promiscuous sexual relationships from an early age, ending in addiction to amphetamine.

Monroe and Drell (1947), in reviewing the use of benzedrine inhalers as stimulants in a U.S. Military prison, discuss one of the inmates who developed ideas of reference with hallucinations. The authors suggest that persons with certain personality traits, e.g. Inadequate Personality and Immature Personalities with reactions manifest by aggressiveness, were more attached to the use of the drug than others.

Schneck (1948) reported a case of psychosis occurring in a U.S. disciplinary barracks, in which hallucinations and marked delusions of a persecutory character developed in a man following the ingestion of $1\frac{1}{2}$ benzedrine inhalers. Previous personality contained aggressive and anti-social features.

Sargant and Slater (1944) issue a warning against the use of the drug in schizophrenia, in that it may precipitate unexpected bursts of excitement, and provide the initiative to carry out a murderous attack.

The personality of our patient is cyclothymic with features of emotional inadequacy and excessive attachment to his mother. In this connection it is interesting to note that he accused his father of drugging him and making him sleep with his mother, and he has never been able to establish adult emotional relationships with women, always tending to over-idealize them.

It is perhaps difficult to establish a case of addiction to benzedrine, and Guttman and Sargant (1942) have pointed out "that clinging to a drug from which benefit has been derived cannot be regarded as a liability to addiction," but our patient again and again returned to the drug under the influence of emotional stresses and craving, even though he appreciated the dangers of overdosage; therefore, we consider that he is addicted to it. He and others have unlimited supplies of the drug available in the form of benzedrine inhalers containing 325 mgm., and not requiring a medical prescription, though precluded from obtaining it in tablet form under Sch. 1 and 7, D.D.A. In passing, it seems worth while drawing attention to this apparent incongruity in the D.D.A., now that amphetamine and dextro-amphetamine are so widely used.

In America it appears to be far more widely used in this manner, and sale is forbidden in inhalers in certain States unless it is in such a form as to be impossible to assimilate via the gastro-intestinal tract.

The E.E.G. finding appears to be in accord with the work of Hill (1947) and others, who found no constant changes in the E.E.G. when benzedrine was given.

On the two occasions when 10 mgm. of the drug was administered for the purpose of doing E.E.G. investigations, a marked change was noted in his behaviour. Normally he is a shy, self-effacing, diffident type, but within a few minutes he had become voluble and self-assured. At the third time, when 20 mgm. was administered, there was no such change; this may have been due to the administration of ascorbic acid 200 mgm. with the drug.

Monroe and Drell (1947) quote Beyer and Skinner (1940): "*In vitro* studies revealed that it is not oxidized by amine oxidase, but it is by the ascorbic acid-dehydroascorbic acid enzyme system. It is excreted in the urine as the unaltered amine. It is also indicated that it is totally absorbed from the gastro-intestinal tract," and Beyer (1942): "It is also suggested by experiments on dogs that ascorbic acid would aid in amphetamine toxicity," and they suggest that on this basis vitamin C might play a part in the treatment of amphetamine poisoning. Whether the difference in response in our patient was due to vitamin C it is difficult to say, but it would appear that vitamin C might be an adjunct to treatment.

We wish to thank the Medical Superintendent of the Pastures Hospital, Dr. E. U. H. Pentreath, for permission to publish this case, and Mr. Smith, of the Derbyshire Royal Infirmary, for the E.E.G. recordings.

SUMMARY.

A case of repeated psychosis due to amphetamine has been described in an addict.

The psychosis produced was in keeping with the personality, as occurred in other cases reported.

The incongruity in the law governing the sale of amphetamine is noted, and the possible need for a different type of inhaler.

Vitamin C may prove useful in the therapy of overdosage.

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A COMPARISON OF DESOXYEPHEDRINE (METHEDRINE), AND ELECTROSHOCK IN THE TREATMENT OF DEPRESSION.

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AND

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EARLY in 1950 we treated 34 depressed patients with desoxyephedrine, in an attempt to discover whether it is comparable in efficiency to electroshock in the treatment of depression in a substantial proportion of cases. We originally intended to treat approximately 100 consecutive depressed patients admitted to hospital, and to compare the results with those obtained in the previous 200 consecutive depressions treated by electroshock. The results, however, caused us to stop the experiment at a much earlier stage.

Rudolf (1949) found that the results from electroshock and desoxyephedrine were similar, and added "If an equally effective and safe alternative to the severe and often uncomfortable E.C.T. could be found, the advantage to the patient would be obvious." It is worth stating that we started this enquiry in the hope that desoxyephedrine would provide just such an alternative. We also had in mind the possibility that desoxyephedrine might enable a proportion of patients to be treated with a smaller deployment of trained psychiatric workers than are required for electroshock.

Scope of the Enquiry and Types of Case Considered.

To ensure the best possible conditions for full evaluation and detailed observation of cases, it was decided to limit this enquiry to patients treated in hospital. As Carlton Hayes Hospital provides all the psychiatric services for its catchment area, and as it has no waiting list for voluntary patients, there are no local factors tending to limit admissions to cases of serious disturbance or poor prognosis.

In view of the original plan, a survey was made of 200 consecutive admissions treated by electroshock, for purposes of control. Of these, 125 were women and 75 were men. The cases treated by desoxyephedrine were also consecutive admissions, diagnosed as suffering from depression, unselected in any way except that cases in whom the depression was considered to be

secondary to anxiety were not treated by desoxyephedrine owing to the risk, mentioned by Rudolf (1949), of increasing their anxiety or agitation. Owing to the chances of the admission rate acting over a short period, the series of 34 cases treated by desoxyephedrine consisted of 27 women and 7 men.

The Control Series.

For the purpose of this enquiry the previous personality was assessed according to the criteria of Paster and Holzman (1949). They described three categories, "Excellent," "Good" and "Poor," as follows:

"Excellent: The patients considered to have had an excellent prepsychotic personality revealed no history of neurotic or psychotic determinants, had a good occupational record and adjusted well socially.

"Good: Those considered to have had a good prepsychotic personality revealed a history of common neurotic determinants. They over-reacted to situations of moderate emotional stress, but they had not manifested incapacitating neurotic behaviour or malignant mental trends and had adjusted fairly well in their respective communities.

"Poor: The patients considered to have had a poor prepsychotic personality had a past history replete with neurotic determinants and psychopathic traits. They were unable to meet adequately everyday stress and strain. Their occupational records were poor. . . . They had often been treated for nervousness. Several of them revealed a history of previous psychotic episodes and insitutionalization."

This method was recognized to be somewhat rough and ready, but was considered accurate enough for the purpose in view. In the survey of the control series, the number of "Excellent" personalities was found to be so small that they were classified with the "Good."

Results in the control and treated groups were described in four categories, as follows:

1. Complete remission. These patients were free from psychotic symptoms when they left hospital.

2. Social recovery. These patients had left hospital with residual symptoms insufficiently severe to prevent them from doing useful work and adjusting, to some degree, to domestic life. Cases removed from hospital to be cared for at home were not included.

3. Improved. These patients were relieved from their symptoms to some extent, but not sufficiently for the hospital to initiate their discharge.

4. This group included those who were worse or unchanged after treatment, and also those who relapsed within 4 weeks of discharge to a condition as bad as that before treatment.

The control series was analysed to provide a basis for comparison with the cases treated with desoxyephedrine. The following articles dealing with prognosis in relation to electroshock were studied: Rennie (1942); Kalinowsky (1943); Impastato and Almansì (1943); Malzberg (1943); Cook (1944); Gold and Chiarello (1944); Dedichen (1946); Gralnick (1946); Muller (1947) and Paster and Holzman (1949). From these it appeared that there is general agreement that the following factors have prognostic significance in relation to treatment by electroshock:

1. Age. Senility is of poor import, the best age groups being 11 to 20, and 51 to 60.

2. Duration of illness before treatment. Long duration is of bad import.

3. Previous personality. A poor previous personality is of poor import and vice versa.

4. Clinical picture. It is widely held that the depth of depression *per se*

is of little importance, and that purely depressive states do well. The cases considered to do less well are involuntional depressions with paranoid trends, cases with schizoid features, and patients with cyclic states. Most authors consider that neurotic depressions do less well than psychotic.

There was disagreement about the significance of the following factors, some authors considering them of bad import, some of no import at all:

5. Heredity.
6. Absence of exogenic precipitating factors.
7. A record of previous attacks, whether treated by electroshock or not.

The relationship of the seven factors described above to results achieved in the control group was estimated, and the first four were found to be the most important. An age of 60 or over, a duration of illness before treatment of more than one year, and a poor previous personality, were each associated with a lowering of the discharge rate. As regards the clinical picture, the cases were divided into six diagnostic groups as follows:

1. Involuntional depression.
2. Neurotic depression.
3. Affective psychosis—depressed.
4. Atypical affective psychosis with schizophrenic features.
5. Involuntional depression with paranoid features.
6. Affective psychosis—alternating.

Each of the latter three groups showed a considerably lower discharge rate than the first three.

The control group was therefore divided into five prognostic categories, according to the number of unfavourable prognostic factors present, from 0 to 4, the unfavourable factors being:

1. Age over 60.
2. Duration of illness before treatment of more than 1 year.
3. A poor previous personality.
4. A diagnosis of either—Atypical depression with schizoid features, or
Involuntional depression with paranoid features, or
Affective Psychosis—alternating.

The results in these categories were then tabulated. As no patients were found to have all four factors unfavourable, the number of categories was reduced to four.

Category 1.—No unfavourable factors. Number of cases—82.

Grade of result.	Number of cases.			Percentage.
I	.	32	.	39.0
II	.	44	.	53.6
III	.	4	.	4.9
IV	.	2	.	2.5

} 92.6
} 7.4

Category 2.—One unfavourable factor. Number of cases—73.

Grade of result.	Number of cases.	Percentage.
I	13	17.8
II	47	64.4
III	4	5.5
IV	9	12.3

} 82.2

} 17.8

Category 3.—Two unfavourable factors. Number of cases—38.

Grade of result.	Number of cases.	Percentage.
I	0	0.0
II	21	55.3
III	10	26.3
IV	7	18.4

} 55.3

} 44.7

Category 4.—Three unfavourable factors. Number of cases—7.

Grade of result.	Number of cases.	Percentage.
I	0	0.0
II	1	14.3
III	2	28.6
IV	4	57.1

} 14.3

} 85.7

Technique of Treatment with Desoxyephedrine.

This was as described by Rudolf (1949). An initial dose of $2\frac{1}{2}$ mgm. was given before breakfast. After 2 days a further $2\frac{1}{2}$ mgm. was given at noon. The dose was then increased by $2\frac{1}{2}$ mgm. three times in each week until either improvement or side-effects occurred. The maximum dose given was 30 mgm. per day in two doses. The blood pressure was taken three times weekly, and a morning and evening pulse chart was kept.

When patients showed improvement, they were maintained at the dose sufficient to produce it until their improvement appeared to be stabilized, or until side-effects occurred. When either of these situations arose, administration was either stopped, or continued at a much lower dose. It was stopped in all cases where electroshock was given in the hope of obtaining further improvement, and continued at a lower level in all other cases.

Results of Treatment by Desoxyephedrine.

The results of treatment were classified in the same way as the control series, and the same prognostic categories were used. The percentages were inserted in this table for convenience, although of little value owing to the small number of cases.

Category 1.—No unfavourable factors. Number of cases—5.

Grade of result.	Number of cases.	Percentage.
I	0	0.0
II	1	20.0
III	0	0.0
IV	4	80.0

} 20.0

} 80.0

Category 2.—One unfavourable factor. Number of cases—15.

Grade of result.	Number of cases.		Percentage.	
I	.	0	.	0.0
II	.	0	.	0.0
III	.	1	.	6.6
IV	.	14	.	93.3

} 0.0

} 100.0

Category 3.—Two unfavourable factors. Number of cases—11.

Grade of result.	Number of cases.		Percentage.	
I	.	0	.	0.0
II	.	2	.	18.18
III	.	4	.	36.36
IV	.	5	.	45.45

} 18.18

} 81.81

Category 4.—Three unfavourable factors. Number of cases—3.

Grade of result.	Number of cases.		Percentage.	
I	.	0	.	0.0
II	.	1	.	33.3
III	.	2	.	66.6
IV	.	0	.	0.0

} 33.3

} 66.6

Of the patients who did not improve with treatment by desoxyephedrine, all 4 in Category 1 had subsequent electroshock; 2 achieved Grade I results, the other 2 achieved Grade II results: 10 patients in Category 2 had subsequent electroshock; 6 achieved Grade II, 4 achieved Grade III: 4 patients in Category 3 were given electroshock; 2 achieved Grade II, while 2 achieved Grade III.

The chief reason for failure was the fact that many patients showed side-effects on a dosage insufficient to improve their depression. This occurred in 20 cases, of whom 17 showed increased agitation, while 3 had a rise of blood pressure and pulse rate sufficient to require a lowering of the dose.

DISCUSSION.

The results tabulated above seem to us to indicate strongly that desoxyephedrine is not an agent of equivalent power to electroshock in treating depressed patients. We feel that where electroshock is reasonably well indicated, there is little reason to consider desoxyephedrine as a possible alternative. Even when successful, it is doubtful whether it is less unpleasant for the patient than electroshock, owing to the greater time required before relief from symptoms. Moreover, with desoxyephedrine there is approximately a 50 per cent. chance of actually increasing the patient's sufferings.

An interesting feature of the results, however, is the fact that desoxyephedrine obtained relatively better results in Category 4, where electroshock is least likely to be successful, than in the other categories. Although the number of cases was very small, this suggested to us that desoxyephedrine

might be found to have a useful place in the treatment of depressive conditions which do not respond well to electroshock. Our clinical impressions of the cases dealt with in this study, and of others not included, suggest that desoxyephedrine might be found to have a useful place in the treatment of chronic depressions, in cases of recurrent depression which tend to relapse quickly after electroshock, in cyclic states with rapid alternation of phase, and in atypical affective psychoses with schizoid features, such as emotional flattening, occurring in patients too old for insulin therapy. We feel that further study along these lines, to include consideration of the relationship between desoxyephedrine treatment and leucotomy, might prove rewarding.

SUMMARY.

1. A description is given of an enquiry into the treatment of depressed patients by desoxyephedrine.
2. A control series of 200 patients treated by electroshock is analysed to elucidate those factors associated with good results from the treatment.
3. From this analysis four prognostic categories are derived, and the results to be expected in each from treatment by electroshock are tabulated.
4. The results in 34 cases treated by desoxyephedrine are tabulated in a similar manner.
5. It is shown that in the first three of these categories the results from electroshock are better than those from desoxyephedrine.
6. Attention is drawn to the fact that in the fourth category, where electroshock is poorly indicated, the results from desoxyephedrine are relatively better.
7. It is suggested that it might be worth while investigating further the possible value of desoxyephedrine in depressed cases which do not respond well to electroshock.

ACKNOWLEDGMENT.

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PARANOID STATES OCCURRING IN LEADED-PETROL HANDLERS.

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DURING the early winter of 1943 a series of cases was seen that presented syndromes of emotional disturbance, varying from acute excitement and confusion to depressive traits such as hypochondriasis, vague fears and insomnia. Hallucination, delusions, or ideas of reference, appeared in all. The patients concerned, six in number, were Indian males, all between 20 and 40 years of age, and were referred to the psychiatric section of the combined general hospital at Basra between October and December, 1943. They had a common background, inasmuch as they had all been away from India with their units for a year or more, and were members of military units working in S. Persia, closely in contact with petrol, either as can fillers or can stackers in enclosed spaces. The hours of work were long, and the men were kept at this work for extended periods. It was, at the time, essential to maintain heavy deliveries of petrol, and the men concerned were at work in high natural temperatures with only little consideration being given for possible ill effects from the freely evaporating petrol.

At about this time, November, 1943, the petrol being shipped locally in 4-gallon light cans, had had its octane number considerably raised by further addition of tetraethyl lead. Filling of the cans was done in the open air, by hand, with the men closely watching the filling nozzle. Cans were stacked in the holds of barges by hand, and leakage from damaged cans produced a heavy concentration of fumes in the enclosed spaces in which the men worked daily for long shifts.

The series being dealt with here includes those most severely affected, many others, believed to be less severely affected, remaining with their units, and being dealt with by rotation of duties, and other preventative methods, once the causative factor was appreciated. It was personally observed to the writer by the medical officer in charge of these men, that at about the time the cases reported here were seen, quarrelsomeness, irritability and increased complaining regarding minor injuries and ailments was noted during routine care at the units concerned.

The cases are described in the order in which they were seen at the psychiatric department of the hospital.

CASE 1.—An emaciated Indian male, aged 40. He had been ill for some time prior to admission and was transferred to the mental hospital wing on account of increasing excitement, restlessness and unmanageability. In the ward he was seen to be disorientated and confused as well as hyperactive, screaming, obstructive,

ignoring nursing attention and incontinent of both faeces and urine. His facial expression was that of acute terror, and, with fixed gaze, he appeared to be visually hallucinated.

There was slight pyrexia, and no tachycardia. Physical examination revealed no abnormalities, blood slides were negative for malaria, and serology was negative for syphilis. The patient was very wasted, but at the time this was not considered significant. Treatment consisted of rest, sedation, and attempts to maintain nutrition. The patient died on the fifth day.

Post-mortem findings: Lungs, heart, stomach, spleen, liver, N.A.D. Kidneys congested, capsule stripping easily. Skull, no evidence of injury. Brain, dura adherent to calvarium. The surface of the brain deeply congested. All meningeal vessels congested. Serial sections through cerebral hemispheres and brain stem revealed innumerable punctate haemorrhages.

Microscopical Examination.

Pons: There are areas of marked demyelination which seem to be limited to individual bundles of fibres. There are also a few isolated perivascular haemorrhages. There is no evidence of chromatolysis or other degenerative changes in the individual nerve cells. There is no evidence of syphilitic or other form of acute or chronic infection. *Cortex:* the vessels are mostly well filled with R.B.C., but there is no marked vascular engorgement. C.S.F. appeared normal macroscopically and microscopically.

In the absence of an history of exposure to known toxins or narcotics, and lack of physical signs, death at the time was considered to have been due to exhaustion resulting from manic excitement of unknown aetiology.

CASE 2.—A normally-built male of 26, in a state of poor nutrition. No record was available as to his condition (except that he attempted self-injury) prior to admission. When first seen in the mental ward he was restless, noisy and obviously in a state of fear. He was completely unco-operative and entirely at the mercy of an inner life apparently unrelated to his surroundings. His disorientation and confusion was accompanied by auditory hallucinations, and the patient was disorientated as to time and place. Physical examination was negative in regard to all systems, and liver and spleen were not felt. Blood counts were R.B.C. 5,000,000, Hb 80 per cent., W.B.C. were 11,000 with normal differential counts. Serology was negative for syphilis and the sedimentation rate 12 Westergren in one hour. The only other physical positive finding was gross wasting. No parasites were found in the stools, and blood slides for malaria were negative.

The patient continued restless, noisy, destructive, aggressive and unco-operative. He was careless of faeces and urine. Throughout his illness he continued deluded, incoherent and resistive to attention. The intensity of his fears increased at night, with resultant worsening of his behaviour. Sedation with chloral, paraldehyde, morphia or hyosine was required, and tube feeding was instituted on account of refusal to eat, but further physical deterioration took place. The patient's mental condition did not improve, and he died on the 20th day after admission.

Post-mortem findings: An extremely emaciated young Indian with absence of fat throughout the body.

Cardiovascular system and abdomen showed no macroscopic abnormalities, and the lungs showed only a terminal broncho-pneumonia. The liver was normal and the spleen showed no evidence of acute or chronic infection. The brain, on inspection, was slightly congested, and incisions through the hemispheres revealed punctate haemorrhages in both grey and white matter. Microscopically the cortex showed no abnormalities, but the pons showed numerous small rounded spaces diffusely spread through it that looked as though individual nerve fibres had demyelinated and disappeared.

CASE 3.—A depressed, emaciated Indian aged 26. Prior to admission he had attempted to cut his throat. He was very agitated, and almost immediately after admission became aggressive, negativistic, and resentful of nursing care. On physical examination there were no positive findings, except that he weighed only 70½ lb. Blood slides were negative for malaria, and white and red cell counts were 5,200 and 3,250,000, Hb 80 per cent. respectively. Kahn was negative.

During hospitalization, for the first three weeks, there was evidence that the patient's violent behaviour was related to delusions of persecution of an unspecific

type. The condition of fear would become worse in the evening, and improve again in the morning. Mechanical restraint was needed in addition to choral, morphine and hyoscine, to prevent him injuring himself during this period. The possibility that vapourized lead might be a factor in the case was recognized, and intravenous magnesium sulphate and an alkaline mixture were given early. The patient's condition started to improve, and after some 2-3 weeks sedation could be discontinued. (There was a short relapse after 13 days, but this rapidly cleared up). Vague fears, especially at night, persisted for some weeks, but recovery continued, and eventually the patient was discharged from hospital.

CASE 4.—A 34-year-old, emaciated Indian who had been found wandering at large by the military police. When seen at hospital he was stuporose, confused, and in an exhausted state. There was no evidence of physical illness, or of the effects of alcohol or narcotic drugs. Later in the day he became noisy and aggressive. Physical examination showed no evidence of abnormality. Heart and lungs were normal, and there was no pyrexia. The only physical abnormalities recorded were a coarse tremor of the hands and an ataxic gait. Blood picture: no malarial parasites, W.B.C. 2,600, R.B.C. 4,400,000, Hb 80 per cent., Kahn, negative.

Mentally, he was confused and disorientated in time and space, and he continued to be aggressive and destructive for two weeks. During this period he demonstrated ideas of reference, fears especially well marked after dark, and of an aggressive persecutory type. Treatment consisted of sedation, feeding in spite of resistance, intravenous magnesium sulphate, and an alkaline mixture. At the end of a fortnight his condition was much improved, and no evidence of psychosis was evident when he was transferred from hospital at a later date.

CASE 5.—A well-nourished Indian of 22. His illness had commenced with insomnia, and he had run away from his unit in an excited, anxious, deluded state, believing that he was going to be murdered. On admission to hospital he was normally orientated and coherent. He still thought that his life was in danger from someone whom he could not specify. Physical examination was negative in all systems. Blood slides for malaria were negative, as was the Kahn test. White blood count was 6,400 with a normal differential, red count 4,250,000, reticulocytes 6 per cent.

He was early put on intravenous magnesium sulphate and mist. alkalina. He later showed positive malarial slides and received a full course of antimalarial drugs. He made a steady recovery and was discharged from hospital as fully recovered after a short stay.

CASE 6.—An Indian aged 27, who had complained of vague pains and uneasiness for the previous two to three weeks. In addition, he had had generalized headaches, anorexia, nausea and insomnia. He had been losing weight, the amount unspecified, and he felt physically weak. The feeling of uneasiness was a vague idea that something dangerous might happen to him.

Physical examination was negative except for bile pigments in the urine. These rapidly cleared up, and there were no other abnormal physical signs. No specific treatment was instituted, and he rapidly improved, losing his fears and eating well with recovery of physical well being. No detailed information on his physical condition has been retained.

DISCUSSION.

The whole series was seen between 18 October and 4 December, 1943. (The weather was still hot, autumn temperature having been up to 115 in the shade during the previous month.) As reported, the conditions had certain similarities, and the men had a common background, inasmuch as they all came from units closely associated in similar work. The absence of physical signs eliminated systemic conditions such as cerebral malaria, heat stroke, acute or chronic alcoholism or the effects of narcotic drugs, and the lack of

positive findings caused one to think in terms of functional conditions giving rise to gross mental disturbance, among which, commonly seen at that time were reactive depressive states with paranoid colouring, as well as the more familiar depressive states, neurotic as well as psychotic. Social investigations immediately showed that all these men had been intimately concerned with the handling of petrol for various periods, i.e. :

No. 1, for an extended, but not exactly known, period.

„ 2, three months.

„ 3, six months.

„ 4, two years.

„ 5, four months.

„ 6, four months.

The symptoms did not strongly support the likelihood that the men were suffering from petrol poisoning alone, inasmuch as dizziness, drowsiness, confusion and collapse, rapidly recovering on exposure to fresh air, were not present. The differential diagnosis appeared to rest between malaria, consumption or deprivation of narcotic drugs, alcoholism, carbon monoxide or mercury poisoning, encephalitis, vitamin B complex avitaminosis, acute infections, G.P.I., and, since the petrol was heavily leaded, tetraethyl lead toxic psychosis.

Machle's observations on tetra-ethyl lead poisoning, which were available, suggested that the diagnosis of tetra-ethyl lead psychosis could rest on an authentic history of exposure to the poison, the presence of symptoms of excitement, possibly maniacal, insomnia, anorexia, weakness, loss of weight, combined with increased lead concentration in urine and faeces. The common features of plumbism do not occur, i.e. blue line, colic, constipation, or wrist drop. In a series of 14 cases quoted by him, only three had stippled cells, and none showed the typical blood picture of lead poisoning. There is no specific picture regarding the onset of symptoms in this intoxication, and the type of psychosis seems to depend on previous personality and the massiveness of the dose of tetra-ethyl lead received. The local conditions at the time made microchemical analysis for lead virtually impossible, but a tentative diagnosis of tetraethyl lead psychosis was made on the grounds of the clinical pictures given by the patients, the absence of physical signs that would support any of the other conditions included in the differential diagnosis, combined with known long exposure to highly leaded petrol fumes. In addition, all the cases showed a degree of reticulocytosis of 4-7 per cent., exact figures no longer being available.

Compared with Machle's and Kehoe's series of 78 patients suffering from tetra-ethyl lead poisoning, this series showed mental excitement more frequently than insomnia, but this may have been more apparent than real, as sedatives had to be used liberally. Ease of fatigue, frequently noticed by Machle, was not a presenting symptom, whereas loss of weight stood out in both series. There is no record of deaths in the above-mentioned series, whereas the two most severely affected of this series died, in each case with cerebrovascular engorgement, punctate haemorrhages in grey and white matter, and pontine demyelination.

Treatment was directed at immobilizing the lead in the tissues, where the degree of illness warranted it, releasing it slowly, and at the same time controlling the acuteness of the excitement, combined with regard to the maintenance of the physical condition of the patient.

SUMMARY.

Six cases of varying degrees of mental disturbance in adult Indians is presented. All were concerned in working with petrol heavily charged with tetraethyl lead, over long periods. Gross loss of weight, mental confusion, fear and paranoid ideas, worse at night, stood out in the series. The two most deeply disturbed patients died, and the P.M. findings are given. No record was available of previous personalities.

I wish to thank the colleagues who were concerned with me, at the time with this series of cases, Capt. J. H. Lankester, R.A.M.C., Unit M.O., Major L. C. Smith, I.A.M.C., and Major J. Spencer, R.A.M.C., pathologists for P.M. examinations, Lieut. P. R. Pires, I.A.M.C., who was principally concerned in the treatment of the admitted cases, and Pte. C. Stringfield, M.N.O., R.A.M.C., who looked after them in the main, and on whose secretarial work this article is founded.

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SOME STUDIES OF THE AMINO-ACIDS IN BODY FLUIDS IN PATIENTS WITH VARIOUS FORMS OF MENTAL DISEASE, BY PAPER PARTITION CHROMATOGRAPHY.

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THE metabolism of nitrogen-containing compounds, and in particular amino-acids, in mental patients, has aroused interest in recent years for the following reasons.

Firstly, Gjessing (1938) and Hardwick and Stokes (1941) found changes in nitrogen balance in periodic catatonia. However, Beattie (1947) demonstrated a negative nitrogen balance in various types of patients confined to bed for illness or injury, thus offering a possible new interpretation of the previous observations.

Secondly, Man, Bettaker, Cameron and Peters (1946, 1947) showed that total plasma α -amino nitrogen fell after injury, and also that schizophrenic patients undergoing prefrontal lobotomy showed similar post-operative falls, a return to normal taking place on recovery in each series. Man, Bettaker and Brown (1947) reported a lowered range of plasma α -amino nitrogen in schizophrenia, compared with the figures for a normal range given by Woodruff and Man (1945). Horwitt (1944) also reported a rise in blood α -amino nitrogen following improvement with insulin shock therapy in recent schizophrenic patients.

Thirdly, there is some very conflicting evidence about the hippuric acid synthesis test involving the metabolism of glycine. Quastel and Wales (1938, 1940) and Michael, Looney and Borkovic (1944) claim a subnormal hippuric acid synthesis in certain cases of schizophrenia, but Greville (1945) was not able to confirm this.

Hence, a survey of amino-acids in body fluids seemed to be indicated. Paper chromatography was chosen as a suitable rapid method for a qualitative investigation, with a view to further more accurate studies if abnormalities were found.

CLINICAL MATERIAL.

In order to obtain a random selection of patients, consecutive admissions over a period of 4 months were studied. This group of 121 patients was found to contain only 19 schizophrenic patients. In order to enlarge this small number quickly, 20 recent schizophrenics from Cane Hill Mental Hospital were also examined (by kind permission of Dr. Alexander Walk). Eight

epileptic children were examined during the course of other experiments, thus bringing the total number to 149. No chronic institutionalized patients were included in the series, to avoid any confusion with changes which might be caused by long hospitalization. The ages of the patients ranged from 8 to 70, but the majority of the patients were in the third, fourth and fifth decades. The proportion of females to males was 1:13:1.

The patients were grouped in 6 broad groups as follows:

	No. of cases.	Percentage of total.
1. Schizophrenia (including 2 periodic catatonias) .	39	26
2. Manic depressive psychosis (including reactive and endogenous depressions, involutional melancholia and 1 mania)	47	32
3. Anxiety state and hysteria	24	16
4. Organic disorders (including 2 senile dementias, 3 head injuries, 2 cerebral tumours, 2 neuro-vascular syphilis, 2 post-encephalitics, 1 myxoedema)	12	8
5. Epilepsy (idiopathic)	11	7
6. Unclassified (including 4 alcohol addicts, 1 puerperal psychosis, and psychopathic personalities) . .	16	11

A series of 48 normal controls of both sexes were also studied. All patients had urine examinations: 119 cases (= 80 per cent.) had plasma examinations, and 25 patients (= 17 per cent.) had cerebrospinal fluid (C.S.F.) examinations also (i.e. where a lumbar puncture was performed for some other reason). Of the 48 normal controls, 15 persons had plasma examinations. No control C.S.F. was available.

The collection of specimens was as follows. The first morning specimen of urine was obtained, fluids having been withheld for 12 hours in order to obtain a concentrated specimen. About 10 ml. of heparinized blood samples were taken 3-4 hours after breakfast. No special dietary alterations were made. Except in the Cane Hill group, all patients were examined during the first week in hospital, prior to any form of treatment being instituted. In the Cane Hill group, patients were not receiving treatment at the time of examination. Tests were repeated only if there was reason to doubt the normality or validity of the first test, except in the case of 2 patients with periodic catatonia, in whom tests were done during the phases of positive and negative nitrogen balance.

EXPERIMENTAL.

1. Preparation of Specimens.

Preparation of specimens before examination was as follows. Plasma was separated from whole blood by centrifuging as soon as possible after collection. All specimens were examined immediately after collection or stored at -20°C . Plasma and C.S.F. were dialysed through a collodion membrane under pressure at 6°C . (Dent and Schilling, 1949). Inorganic salts were

removed by the electrolysis apparatus described by Consden *et al.* (1947). In each case 625 μ l. of ultrafiltrate were applied in a small spot 1.5 cm. diameter in one corner of the filter paper. Urine samples were applied "neat," except in doubtful cases where better definition of the amino acid spots was required, in which case the specimens were also desalted first. The quantity of urine used was varied with the specific gravity as follows. If the specific gravity of the urine was 1020 and over, then the quantity examined was 25 μ l.; 1014-1018, 38 μ l.; 1008-1012, 50 μ l. respectively. These volumes were derived from the results of experimental chromatograms comparing the number and density of the spots with various quantities and dilutions of urine.

2. Chromatographic Technique.

The technique of Consden, Gordon and Martin (1944) and Dent (1946, 1 and 2, 1947 and 1948) was followed in principle, but an ascending method was used similar to that described by Williams and Kirby (1948). The apparatus used consisted of glass tanks 48 cm. long $\times$ 32 cm. broad $\times$ 50 cm. high, containing the solvents, fitted with plate-glass tops. This enabled 9 sheets, 27 cm. square, to be examined simultaneously by two-dimensional chromatograms. The sheets were suspended on a rack consisting of 4 horizontal glass rods at each corner, held in position by diagonal aluminium cross-bars at each end. They were prevented from touching each other by removable glass collars slipped onto the rods in between each sheet. The sheets remained on the racks during the entire experiment, and were only removed for spraying purposes. Damp filter paper was placed along the walls of the tanks to ensure saturation of the atmosphere with water vapour. A small beaker on the bottom of the tank contained any additional materials, such as 0.1 gm. sodium cyanide, and 4 drops of ammonia solution (S.G. 0.880) in the phenol tank (Dent, 1948), and 4 drops of diethylamine (Consden *et al.*, 1947) in the collidine tank. Solvents used were phenol, and "collidine" solutions, the latter consisting of a mixture of 2 : 4 : 6 collidine and 2 : 4 and 2 : 5 lutidines. Both solvents were saturated with water at working temperature. The paper used was Whatman No. 4. The papers were dried in an air oven between 30 and 40°C., sprayed with ninhydrin (0.1 per cent. in *n*-butyl alcohol) and developed by heating with a "cool" flat-iron until the maximum colour developed. The experiments were carried out in a dark basement room, where there was little change of temperature.

Any doubtful spots were confirmed by repeating the examination, together with "marker" amino-acids, which superimposed on the corresponding spots when mixed with the unknown specimen.

No attempt was made to separate amino-acids which overlap on the chromatogram unless abnormalities were found (map of spots, Dent, 1948). In a few cases, however, specimens were subjected to acid hydrolysis, to separate alanine from glutamine and gain a rough idea of the usual proportions of each present in the large mixed spot.

About one-third of the estimations were carried out in duplicate to make sure that apparent variation between different batches of squares were not significant.

The urines were also chemically tested for cystine by the cyanide nitroprusside test (Brand, Harris and Biloon, 1930).

3. *Recording of Results.*

The results were recorded in the following way, according to the method of Dent and Schilling (1949).

The spots were numbered immediately after development, and compared with a chart copied from a graded series of colour spots made up from known quantities of amino-acids, and recorded by an arbitrary number. In this way the results could be more easily compared one group to another, and to the normal controls. Nos. 1-3 were faint spots, 4-7 moderate, and 8-10 strong spots. By trial and error, specimens were diluted or concentrated so that the spots came within the range of the standard charts, but the error was about ± 30 per cent.

4. *Assessment of Results.*

One or two points must be discussed about technique. R_F values (that is, the ratio of the distance travelled by the amino-acid to the distance travelled by the solvent) of the acid agreed well with those described by Dent (1946, 2). Separation of the spots on this size square was quite good, and there was no overlapping, except in the cases already mentioned. The degree to which glutamine and alanine separated was variable, but sometimes it was quite considerable.

Two major difficulties only were encountered. The basic amino-acids were frequently lowered in concentration, and this was found to be due to the excessive depth of the tanks, making it difficult to obtain a sufficient concentration of ammonia vapour around the bottom of the papers, which enables free movement of these amino-acids to take place. Glutamic acid was occasionally high in concentration with reciprocal loss of glutamine, and this was found to be due to breakdown of small quantities of glutamine during various stages of the preparation of the samples, particularly during the desalting, in spite of the usual cooling precautions. Otherwise the method worked well, and the great advantage was the "mass production" speed at which specimens could be examined once the method was established. Duplication of squares in different batches showed only small variations.

RESULTS.

The results were considered in two ways.

The method was regarded as qualitative and for the purpose of identification mainly, it being very sensitive to the degree of detecting about 1-3 μ g. according to the amino-acid. However, a very rough quantitative measure was also taken as previously described, and is recorded here.

In all the groups, as compared with the normal controls, there was no abnormality of pattern of the amino-acid chromatogram. No unusual or abnormal amino acids were found. Although there was considerable variation of the strength of the spots, the average arbitrary number representing the

concentration of each amino acid in each group was exactly the same. The variations encountered came within the limits of accuracy of the method, and did not relate to any one particular group. The following amino-acids were identified.

Plasma.

Plasma contained the following amino-acids in all specimens (the number in parenthesis refers to arbitrary measure of concentration) :

Glutamic acid as a faint or moderate spot (1-6, mean 3).

Glycine as a faint or moderate spot (1-7, mean 3).

Glutamine and alanine as a moderate or heavy spot (4-9, mean 6).

Valine as a moderate spot (2-7, mean 4).

Leucine (including isoleucine) as a faint or moderate spot (2-7, mean 4).

Serine and threonine as faint spots (1-3, mean 2).

Taurine, lysine and aspartic acid were present as faint spots in about 70 per cent. of the cases.

Tyrosine, phenylalanine, histidine, proline and arginine were occasionally identified.

The accompanying diagram gives the results with respect to valine in plasma ultrafiltrate, and is included to show the way in which the results were analysed and the variation and mean values obtained for each amino-acid. As stated

No. of cases

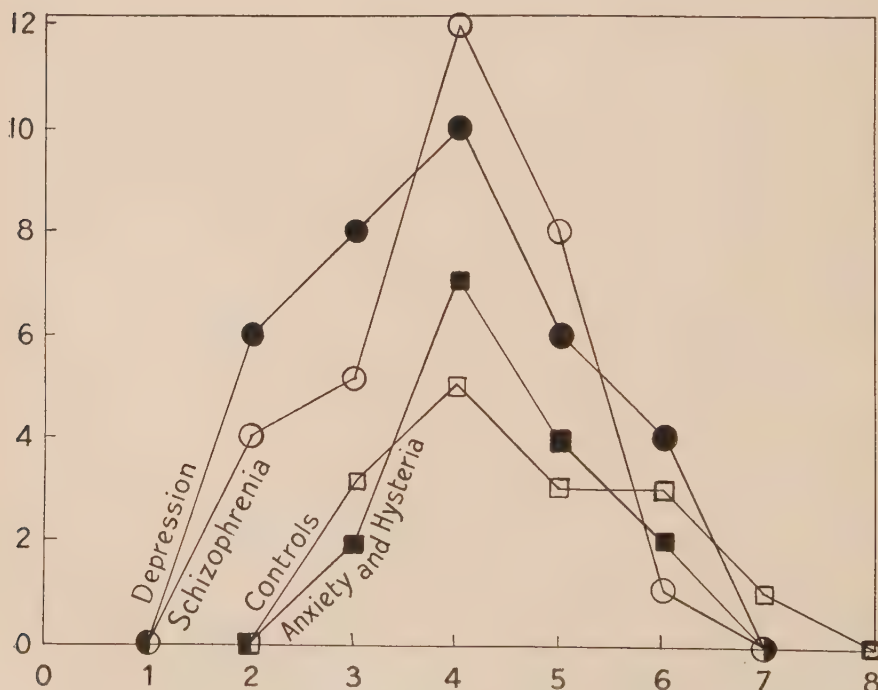


FIG. 1.—Frequency of occurrence of valine concentrations in plasma ultrafiltrate in different groups of subjects.

previously, the variations recorded are within the limit of accuracy of the method.

Urine.

Glycine and alanine were present in all squares as faint or moderate spots (1-7). Serine, valine, leucine (including isoleucine), glutamic acid, glutamine and histidine were present occasionally as faint or very faint spots (1 or less). Taurine was present in about half the cases as a faint spot (1-3). Cystine was present in traces in large numbers of urines, but no cases of cystinuria were found.

C.S.F.

Glutamine was present in all specimens as a moderate spot (4-7, mean 5). Valine, leucine (including isoleucine), glycine, alanine, glutamic acid were commonly present as faint spots (0-2, mean 1). Hydrolysis of a few specimens showed the large "glutamine-alanine" spot to be composed mainly of glutamine.

DISCUSSION.

The findings being negative, further chemical investigation of amino-acids was not carried out. The chromatographic method is very sensitive in detecting the presence or absence of amino-acids, and therefore as a qualitative test, it proves the normality of the amino-acids in plasma and urine of these patients. Since no control C.S.F. was available, no definite conclusions can be made, but there is a strong probability that C.S.F. also is normal in these patients. Any variations in the strength of the amino-acid spots were not significant and variations were spread evenly throughout the groups. It is impossible to compare the results directly with those of other methods, as quantitative results by this method are too vague to be of any value. As previously described, the size and colour of the spots were matched with spots formed by known amounts of pure amino-acids. When allowance had been made for the change in volume of the specimens due to ultrafiltration, the approximate concentrations in the specimen thus obtained came within the range of values obtained by microbiological methods by Hier and Bergeim (1946) and Solomon, Hier and Bergeim (1947) in plasma and C.S.F. The amino-acids which appeared in urine agreed with the results of Dent (1946, 1).

Quantitative variation in total amino-acids, such as that described by Man *et al.*, could not be confirmed, since the variation was too small to be detected by this method. However, since these studies prove the normality of the pattern of the amino-acids in schizophrenia, the lowered range reported in this condition could not have been due to a large variation in a few of the amino-acids, but rather to a proportional change in all of them. In spite of the changes in nitrogen balance reported by Gjessing in periodic catatonia, no difference could be demonstrated in two patients with this condition when the amino-acid findings in their urine, plasma and C.S.F. were compared during the phases of positive and negative nitrogen balance.

SUMMARY.

A method of ascending paper partition chromatography of amino-acids in urine, C.S.F. and plasma has been described.

A series of 149 patients suffering from various forms of mental disease, and 48 normal controls were studied. No significant differences between the two groups were found.

ACKNOWLEDGMENTS.

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THE USE OF CURARE-MODIFIED E.C.T.*

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THE purpose of this paper is to establish two points: first, the safety and relative simplicity of curare-modified E.C.T., and secondly, the need for such a treatment.

With regard to the first point, the technique employed is that described by Hobson and Prescott, with minor modifications. Hobson reports no deaths or real difficulties treating allcomers, that is, all his patients requiring E.C.T. The present writer reports on 412 treatments given to 60 female cases who have been specially selected as being unfit for unmodified E.C.T. No deaths or real difficulties have occurred, nor have they in 25 male cases treated by my colleague, Dr. Watt.

It is admitted that deaths have been reported with curare and E.C.T., but most of these were due to respiratory paralysis, which may be avoided by adopting the method to be described. On the other hand, 29 deaths due to unmodified E.C.T. have been collected by Will and Neumann. Regarding the risks of E.C.T., there is much divergence of opinion in the literature as to what physical disability does or does not constitute an obstacle to E.C.T. Thus Jones and Merskovitz are unwilling to treat patients over 60 with any kind of heart disease, or with tuberculosis, whereas Kalinowsky and Hoch are prepared to treat patients with a systolic blood pressure over 200 mm. Hg and patients with active tuberculosis. Sargent and Slater hesitate before treating patients with impaired cardiac function, chest disease, old age and frailty. Most authors, however, do agree that recent fractures and spinal injuries are a bar to treatment.

It is here claimed that the only contraindications to treatment are the presence of severe cardiac failure, any condition interfering with a clear airway, and, on general principles, the presence of active infection.

The technique is as follows:

d-tubocurarine chloride (Duncan Flockhart) is the drug employed to modify the convulsion. This is mixed with thiopentone and atropine and the whole given by rapid intravenous injection. The initial dose of curare is based upon the body weight, 2.5-3.0 mgm. per stone according to various considerations such as muscularity, and the degree of modification of fit required.

0.25 gm. of thiopentone and atropine gr. $\frac{1}{100}$ are given as a standard dose in every patient. These doses are altered in subsequent treatments if necessary.

* A Paper read at a Meeting of the South-Eastern Division of the Royal Medico-Psychological Association held at Shenley Hospital on 27 April, 1949, and awarded a Divisional Prize in May, 1950.

The thiopentone is given to avoid apprehension and the very unpleasant sensation of curarization, also to facilitate artificial respiration. Atropine helps to maintain a clear airway.

A Phillip's airway is introduced as soon as breathing ceases, and oxygen is insufflated by means of the Lucas resuscitator. This allows a positive and negative pressure to be produced in the chest, while the bag automatically fills with oxygen when necessary.

Two to three minutes after the injection the electric stimulus is given and a major fit ensues. In a well-curarized patient there is no movement of the spine or limbs, but there are always some clonic movements of the face, enabling one to see whether or not a major fit is taking place.

In an attempt to lessen the number of treatments necessary to effect a cure I have recently been inducing 2 or 3 G.M. fits with an interval of a minute during which oxygen is given. The second and third fits are less pronounced than the first.

Oxygen resuscitation is then continued until respiration recommences spontaneously. The phase of apnoea lasts from two to forty-five minutes. The majority of cases, however, are breathing again within ten minutes.

Prolonged apnoea gives rise to no real difficulty or anxiety, and, unless there is a fall of blood pressure or other complication, there is no need for further interference.

Coramine and prostigmine are at hand should the necessity arise but these have never been used, except in one case in which there was a progressive fall in blood pressure during a prolonged period of apnoea. In this case coramine was given intravenously to stimulate respiration, with good effect. The fall of blood pressure is due to interference with the venous return.

Ten to fifteen minutes after the recovery of respiration, during which time the airway has to be carefully watched and the jaw held, consciousness is regained. The patient then generally feels more comfortable sitting up.

Patients are able to get up and walk one to two hours after treatment.

Laryngeal spasm, which Hobson mentions as being quite common, has only occurred in mild form in one case.

The only other complication which has occurred is described in a case-report to follow.

The need for some form of modified E.C.T. can first be illustrated by giving you the length of stay in hospital some of these patients had before having treatment. One of this series was a patient for 15 years, another for 10, and six others for periods of over one year. All these have been discharged.

Secondly, the large number of patients with bony injury, definitely unsuitable for E.C.T., is shown by the results of routine X-ray examination.

It has been the practice at Shenley to have the spines of all patients X-rayed before undergoing E.C.T. Since the beginning of 1948 some 400 cases have been radiographed. This number includes a few patients X-rayed for other reasons.

Forty-four of these cases had fractures of the spine, a further 42 showed other injuries such as prolapsed disc, slight wedging of the vertebral bodies, diminished joint spaces, etc. In addition, 23 cases showed other contra-

indications to E.C.T., e.g. Paget's disease, tuberculosis, gross osteoporosis, osteoarthritis, etc.

It is perhaps of interest to note that of the 44 cases with fractured vertebrae, 33 had had E.C.T. previously, whereas of the 293 cases with normal spines, only 55 had had shock treatment. Of 106 cases previously treated with E.C.T. either here or at other hospitals, 32 had fractures of the spine. If it is assumed that these fractures are directly due to E.C.T., then the percentage of fractures due to unmodified E.C.T. is around 30.

It should also be mentioned that of the latter, only half a dozen or so had symptoms of pain in the back, and therefore it follows that without routine X-rays before and after E.C.T., only a small percentage of fractures are detected.

The prevalence of unsuspected spinal injury, in addition to supplying case-material for the writer, provides a strong argument in favour of universal adoption of curare-modified E.C.T.

Twenty of the present series were cases of fractured spine.

Patients with other bony abnormalities, e.g. tuberculosis of joints, Paget's disease, fractures in plaster, etc., demand a modified form of E.C.T. if they are to have it at all.

The need for this treatment is further extended by patients with various pulmonary and cardiac conditions.

Thirteen of the present series had hypertension, complicated in two cases by cardiac failure, another by auricular fibrillation. Two others had electrocardiographic evidence of past coronary thrombosis. This group was given larger doses of curare, thereby abolishing almost entirely all movement, and in consequence the violence to the circulation. With full curarization oxygen resuscitation is made easier and cyanosis avoided.

Two cases of inactive pulmonary tuberculosis and one of healing empyema were successfully treated.

Lastly, 5 cases classified as frailty were treated. This includes patients under 6 stone in weight and/or over 70 years of age.

Among advantages of this method might be mentioned :

(a) It is more easily accepted by nervous patients than E.C.T. without an anaesthetic. Thiopentone alone, it would seem, involves all the inconveniences of treatment by curare, without its added advantages.

(b) More time and consideration can be given to the case while routine investigations are carried out, thus, in this series at any rate, providing cases of good prognostic value. This is illustrated by the recovery rate in this series of 60 cases :

Thirty-two patients have been discharged, recovered.

Six are recovered and awaiting discharge.

Five are unchanged.

The remainder are improved or are still having treatment.

The disadvantages of the method are :

(a) The extra time involved (one case takes at least $\frac{3}{4}$ hour). On the other hand, 6 may be done in $1\frac{1}{2}$ –2 hours.

(b) Additional apparatus is necessary.

(c) There is a potential risk of hypersensitivity to curare or thiopentone.

In conclusion, I will read two case-reports, which will illustrate some of the points mentioned.

The first—a more or less typical one—is a patient of 41 years who was admitted to this hospital on 2 October last, suffering from depression with suicidal thoughts. She was started on a course of E.C.T. on the 15th. After her second treatment she sustained a fracture of the dorsal spine. She remained depressed, and on 19 February was started on a course of curare-modified E.C.T. On each of 7 days she was given 20 mgm. of curare with pentothal and atropine intravenously. Each fit was reduced to face and hand movements only. Oxygen resuscitation was only needed for 10 minutes. She has improved considerably, but is as yet not keen to return home. Repeat X-ray of the spine shows no further injury.

The second case is that of the most seriously ill patient so far treated and the only one who gave cause for anxiety. A housewife aged 64 first became mentally ill at Christmas, 1938, starting with insomnia and worry. While in a general hospital where she was having a B.M.R. she became suicidal and had to be admitted to a mental hospital. Since this time she has been continuously ill, with three admissions as a certified patient in Shenley during her worst phases. On each admission she was diagnosed as depression, being apathetic, querulous, suspicious and deluded. She was convinced that she was covered with lice and that her food had been doped by her husband. Physically she was a poor specimen, 6 st. 8 lb. in weight. Her blood pressure was 170/95. The E.C.G. gave evidence of myocardial damage. X-ray of spine showed an old wedge fracture of D7 with a synostosis of D3, 4, 5 and 6, and marked kyphoscoliosis of dorsal and lumbar spine. In February of last year she had an attack of bronchitis which put her into congestive cardiac failure, with venous congestion in the neck and mild cyanosis. Recovering from this, her mental condition remaining the same, treatment was commenced in March a year ago. She was given 20 mgm. of curare with thiopentone 25 gm. and atropine gr. $\frac{1}{100}$, followed by E.C.T. The convulsion was well modified, but after it the blood pressure rose to 220/130 and the pulse-rate to 130 per minute. Severe venous engorgement of the neck occurred, which persisted for twenty minutes. With continued oxygen resuscitation, however, these signs of cardiac embarrassment subsided satisfactorily. At the second treatment, which was given three days later, 21 mgm. of curare were given, as it was thought that the rise of B.P. indicated an insufficient modification of the fit. This time the onset of venous congestion was delayed five minutes after the E.C.T., but was more severe than on the first occasion. The pulse rate rose to 150 a minute, the blood pressure only slightly raised, and there was in addition severe cyanosis in spite of adequate oxygenation of the lungs. 100 c.c. of blood was then removed by venesection. Her condition gradually improved, and she completely recovered 75 minutes after treatment. In view of her steady mental progress she was again treated four days later. On this occasion she was given 16 mgm. of curare. She began to breathe spontaneously four minutes after treatment, but ten minutes later she had a

recurrence of her previous symptoms. Venesection was again performed, to which she quite rapidly responded.

She recovered mentally, and it was decided not to treat her again unless she relapsed. In fact, she has remained well and has been at her home for a year, X-ray of the spine showing no change. It has been suggested that these attacks of congestive failure were initiated by attacks of paroxysmal ventricular tachycardia and were not due to a direct effect of curare.

EVALUATION OF ELECTRIC CONVULSION THERAPY AS COMPARED WITH CONSERVATIVE METHODS OF TREATMENT IN DEPRESSIVE STATES.

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INTRODUCTION.

ELECTRIC convulsion therapy has been generally accepted as a valuable method of treatment in depressive states. Assessment of the results of this form of treatment has generally been based on a small series of cases, and percentage rates of recovery and relapse have usually been computed on one hospitalization. No report has so far been published of a complete follow-up of patients throughout their frequent hospitalizations and remissions. Nevertheless, it is only on such a long-term basis that treatment of depressive states can be accurately evaluated. It was with this ideal in mind that the present study was undertaken. The clinical cases on which it is based are those of 923 patients treated in the Royal Edinburgh Hospital for Mental and Nervous Disorders between the years 1930-48.

The clinical and statistical evaluation of treatment in depressive states was considered along the following lines :

1. The percentage rate of recoveries in patients treated conservatively compared with those treated with E.C.T.
2. Duration of hospitalizations of the two groups.
3. Frequency of readmissions.

SELECTION OF MATERIAL.

In 1932 a new system of case records was introduced at the Royal Edinburgh Hospital for Mental and Nervous Disorders, whereby the history, further progress and readmissions of patients were more fully described. This was made possible by having a separate folder for each patient, in which every detail was put together, thus replacing the limited space allotted by the old system of keeping the records in large books. The selection of case material came from this new filing system. All cases admitted to this hospital, for whatsoever cause, between the years 1932-48 were scrutinized.

This necessitated the complete perusal of 4,211 case records. From these 4,211 cases, 923 were regarded as fulfilling the necessary criteria for a diagnosis of depressive state. It is not proposed to enter into a discussion here on the variability of psychiatric diagnosis and its dependence on the subjective impressions of the examiner, but instead it is presumed that with a reasonably complete "longitudinal section," in the form of previous history, state on admission, adequate progress notes, etc., the physician can arrive at a fair estimation of the applicable diagnosis in present-day psychiatric nomenclature. Individual prejudice will no doubt appear, even in this type of historical assessment, but whatever the

error, it has, in this study at least, been a uniform one, as the perusal and selection from the four thousand-odd cases were carried out by one individual.

It was found important to assess each case as a whole, not only for the purpose of including it in the selected group, but also for excluding it from cases in which depression is a symptom accompanying other mental disorders. Case records lacking sufficient data whereby the reader could arrive at an independent diagnosis were discarded.

No effort has been spent in this study to separate depressive states of the young or the old from those occurring at the involutional period. Cases that have had a manic episode at any time were excluded.

	Total.	Male.	Female.
Number of cases read	4,211	2,934	2,177
Cases selected as depressive states	923	315	608
Percentage of depressive states in total	21.9	15.5	27.9

THE METHOD OF STUDY OF SELECTED CASES.

When the psychiatric records of the 923 patients were completed, they were subdivided and studied along the following lines:

(1) *Sex*: The 608 female patients and 315 male patients were kept separate throughout the analysis.

(2) *Age*: The division into six age groups is, of course, arbitrary, the intention being to demonstrate the relative frequency of each age group in the total number of admissions.

(3) *History*—in reference to—

Heredity.

Alleged precipitating causes.

Pre-psychotic personality.

Mental symptoms.

Physical findings.

(4) *Type of treatment*:

(a) Conservative, i.e., with sedation, psychotherapy, occupational therapy.

(b) Convulsive therapy: In the great majority of cases the shock treatment used was E.C.T. Five female and nine male patients had received cardiazol on one of their hospitalizations; three female and two male patients had received cardiazol plus E.C.T. The percentage of those receiving cardiazol is so small that they are grouped under E.C.T.

The duration of hospitalization before and after shock therapy and number of convulsions given were studied.

(5) *Number of admissions*: The problem of multiple hospitalizations.

The follow-up of patients has been considered an essential part of this work, since depressive states are notorious for their tendency to recur.

"Follow-up" in these cases also includes "follow back." For instance, a certain proportion of the patients admitted between the years 1932-48 (the chronological section of the files from which cases were selected for the present survey) were found to have had one or more periods of hospitalization for a depressive illness prior to 1932. The reader is reminded that such retrospective periods of hospitalization call for an extension backward in time, and that although all patients studied had at least one period of hospitalization to this hospital between the years 1932-49, the chronological survey dates back to 1900 in the case of female patients, and 1911 in the case of males.

In the greater proportion of cases, however, the first admission to this hospital during the years 1932-48 represented also the first hospitalization for a depressive illness. Of this number, again, a proportion were admitted for a second, third, or subsequent period of hospitalization.

It was comparatively easy to search the appropriate records when retrospective or subsequent admissions were to the parent hospital, but a more difficult problem arose when these related to other hospitals. Yet this search had to be undertaken if any degree of accuracy was to be obtained.

(6) *Duration of illness*: It is extremely difficult in psychiatry to estimate accurately the total duration of the illness. The data available were not always explicit as regards the following two important points: (1) duration of illness

prior to admission, (2) time in hospital after apparent recovery (for almost invariably patients were retained for a varying period of observation and rehabilitation). Therefore, for practical purposes, it is necessary to equate duration of hospitalization with duration of illness, and this plan has been followed in the majority of cases. In a few instances, however, where it was obvious that the patient had left hospital, still suffering from the depressive illness which had dictated his admission, and had subsequently returned after a brief period at home, the two admissions, as well as the period spent outside hospital, were considered and calculated as one hospitalization. In short, every effort was made to study each episode of depression as a unit.

(7) *Mental state*: Patients were classified as—

(a) Recovered.

(b) Improved.

(c) Not Improved (which included those remaining in hospital).

(d) Died.

Follow-up Study.

The methods employed to complete the psychiatric record of each patient were as follows:

(1) Circular sent to all patients discharged from this hospital during the years 1932-48.

(2) Personal interviews with such patients as were able to come up to the Out-Patient Department.

(3) Information made available by the courtesy of the Board of Control as to any earlier or later admission of the patients to other mental hospitals in Scotland.

(4) Correspondence with Medical Superintendents of mental hospitals to which the patient had been admitted.

All the patients were followed up to *November, 1949*.

It was found possible to trace the after-history in 80 per cent., and this figure was regarded as satisfactory in view of the comparatively lengthy chronological period which this survey covers. It was interesting to find that the percentage of cases which could not be traced was almost identical in both the treated cases and the controls, and this, of course, was another factor which facilitated comparison.

The Percentage of Follow-up Study in 923 Cases of Depression.

	Total.	Females.	Males.
Number of hospitalizations . .	1,611	1,054	557
Number with complete follow-up .	1,261	827	434
Percentage of total follow-up . .	78.2	78.5	77.9

Percentage of Follow-up According to Methods of Treatment Used.

<i>Females.</i>	Total.	Conservative.	Treated E.C.T.
Number of hospitalizations . .	1,054	834	220
Number with complete follow-up .	827	649	178
Percentage of total	78.5	77.8	80.9

Males.

Number of hospitalizations . .	557	459	98
Number with complete follow-up .	434	358	76
Percentage of total	77.9	78	77.6

Unit of Comparison.

In this study the individual hospitalization, and not the individual patient, was chosen as the unit of comparison. At first sight this may appear an arbitrary and mechanical device, which subjugates the individual patient to a secondary role. That this is far from being the intention may best be illustrated by some of the reasons which dictated this writer's choice of "hospitalization" as the basic unit in this study.

(1) The patient may well react differently to his first serious depressive illness than to subsequent recurrences. Therefore, it is advisable, in assessing results

of therapy, to compare identical hospitalizations, i.e., first hospitalizations in the control group with first hospitalizations in the treated group, and so on *ad seriatim*.

(2) In a patient with recurring depressive episodes the duration of the intermission period following the first illness may well be different from that following subsequent illnesses. Only a study of the varying duration of intermission periods in a serial number of hospitalizations for each individual patient will reveal whether there exists any gradient common to all.

(3) An individual patient may be submitted to convulsive treatment on one of his periods in hospital, and be treated conservatively on a prior or subsequent hospitalization. In this study many of the patients have been so dealt with at different chronological periods, and therefore may appear in all three groups or, similarly, may appear on several occasions in the same group.

DIVISION OF CLINICAL MATERIAL INTO "TREATED" AND "CONTROL" GROUPS.

"Treated" Group.

In this hospital electric convulsion therapy did not come into general use until the beginning of 1940. The treated group therefore comprises all hospitalizations from 1940-48 in which the individual patient was treated with E.C.T.

"Control" Groups.

At first it had been intended to include in one large control group *all* patients who did not receive E.C.T. in their individual hospitalizations throughout the total period under review. It soon became apparent that the patients not so treated in the period following the advent of E.C.T. differed considerably from their predecessors in the pre-convulsive therapy era. It was therefore decided to have two control groups. The first control group, consisting as it does of patients admitted prior to 1940, includes *all* hospitalizations for a depressive illness. The second control group of patients, admitted subsequent to 1940, contains only those patients who, for various reasons, e.g., age, poor physique, concomitant physical illness, were judged unsuitable for convulsive therapy—they were, in fact, the "poor risk" patients.

The Factor of Selection for E.C.T.

That the treated group differs in composition from the control groups is already obvious from the foregoing. Some form of selection has taken place. Its members are not a chance cross-section of patients suffering from a depressive illness. They are patients (*a*) who show a degree of depression sufficient to warrant convulsive therapy (the possibility arises that mild cases may have been excluded), (*b*) who are considered sufficiently fit to be subjected to the hazards of convulsive therapy, and (*c*) who have signified their willingness to undergo this type of therapy. Admittedly, the hazards of convulsive therapy have steadily decreased in importance with growing familiarity in the use of this type of therapy, and now, with adjuncts like curare, few physical disabilities are considered absolute contra-indications. Nevertheless, this was not so in the early years of this decade, and there is still a natural reluctance to subject an elderly patient, or a patient with a gross physical lesion, to this form of therapy. That the hazards of E.C.T. have been the main factors governing selection is corroborated by the accompanying tables and graphs, which show that both the average age and mortality rate is lower in the treated than in the control group for the same chronological period.

It should be added at this juncture that all deaths were excluded from the final statistical analysis because death, unless in the form of suicide, cannot be attributed to the depressive process. Depression *per se* is not a direct causative factor in mortality.

For the sake of clarity and brevity the various groups have been designated as follows:

- FC1 —First female control group—Hospitalizations from 1900-39.
- FC2 —Second " " " " " " 1940-48.
- FT —Female patients treated by E.C.T. between years 1940-48.
- MC1 —First male control group—Hospitalizations from 1911-39.
- MC2 —Second " " " " " " 1940-48.
- MT —Male patients treated by E.C.T. between years 1940-48.

Are the Two Groups Comparable?

The difficulties of controlled experiment where human beings are the subject of study are too generally appreciated to require reiterated emphasis, but these difficulties are more apparent in psychiatry than in any other branch of medicine. Here aetiology is as yet unknown, and, in default of this, all known factors, heredity, age, precipitating cause, type of onset, severity of illness, pre-psychotic personality, etc., have to be taken into consideration. The diagnosis is often based on the presenting mental symptoms, which, in themselves, are but the verbal expression of the subjective feelings of the patient. It is impossible therefore to select two groups of cases and to say—here we have two identical groups. We have to reckon with the limitations of the clinical material in comparing the efficacy of one method of treatment. Lacking the ideal conditions, the conclusions drawn can have but relative accuracy. It is only by surveying as large a number of patients as possible, over a long period of time, that we can hope to minimize the inevitable errors. Therefore, it is realized that the two groups under consideration here are comparable only in this limited sense.

Problem of Statistical Evaluation.

Conclusions as to the efficacy of any method of treatment in the depressive states must depend on one or more of three criteria, e.g. its ability to shorten the duration of the illness, to prevent relapse, and to increase the duration of the intermission period. In other words, the measured variable by which comparative efficacy is gauged is *time*, and time, as distinct from height, weight, etc., is a variable less well adapted to calculating averages and standard deviations. A few of the fallacies which can arise if calculation in this particular study is subjected to the usual methods of statistical analysis may be profitably demonstrated at this juncture. The duration of a depressive illness varies so much from case to case that average durations are misleading. To take a hypothetical case: Say that a group *X* consists of three patients with individual hospitalizations of 4, 6, and 200 weeks, and a group *Y* of three patients with hospitalizations of 5, 7, and 81 weeks. The average duration in *X* is 71, and in *Y* 31. Yet to compare the two groups on the assumption that the average hospitalization in *Y* is half that in *X* is erroneous. Greater accuracy is achieved by stating that two-thirds of the cases in group *X* have an average hospitalization of 5 weeks, and in group *Y* of 6 weeks, and that in one-third of both groups the illness is more prolonged. The latter method has been used throughout in this study, and it was in order to facilitate this method of comparison that hospitalizations in every group of cases were computed in terms of two-month periods (see table). This point is emphasized because in numerous reported series of cases comparison has been made on "average" durations based on widely varying time periods within each group. Similarly, attempts at calculating the "average" intermission period can give rise to similar erroneous conclusions. If, say, a single case in one of two groups submitted to comparison has an intermission period of 20 years, whereas the majority of intermission periods in both groups vary from 1 to 5 years, it is obvious that a gross discrepancy arises by the inclusion of this single and unique case in its particular group. Of course, the percentage method can also be misleading, and this is particularly so if it is based on a small number of cases. The writer does not wish to claim that the method used in this study is ideal, but to state that every attempt has been made to eliminate methods of calculation which, however arithmetically correct, would result in a spurious interpretation of the factual evidence.

SUMMARY OF CONCLUSIONS.

In an investigation of this kind, when a large number of cases is analysed for a stated purpose, it is usual to defer the enunciation of conclusions to the final paragraph. It has been decided to reverse the usual procedure here, and to present a number of conclusions before submitting the evidence. This course has been undertaken because it was felt that the presentation of the necessarily considerable mass of figures and calculations—compressed though

they are into tables, and illustrated by graphs—would prove altogether too tedious reading without some preliminary "sign-posts" to indicate the results attained at the end of this long and intricate mathematical exercise. The writer is not unaware that this method may have the additional advantage of stimulating the reader to closer scrutiny of the later sections, as the final results are quite other than those envisaged at the commencement of the survey.

(1) *The Percentage of Recovery.*

The percentage of patients discharged from hospital after a depressive illness does not vary greatly whether they are treated conservatively or by E.C.T. Such slight differences as may exist are statistically insignificant.

(a) In the majority of cases, whether treated conservatively or by E.C.T., the number graded as "Recovered" exceeds those graded as "Improved." In the conservatively treated groups the ratio of "Recovered" to "Improved" is less than in the E.C.T. group. When the grades "Recovered" and "Improved" are combined, however, the total percentage discharged is very similar in the two groups. It may well be that the sense of well-being induced by E.C.T. may lead to the more optimistic clinical assessment of "Recovered." That this is not a mere subjective impression held by the writer is shown by the finding—for which evidence will later be presented—that the relapse rate in the "Recovered" within six months of discharge is greater in cases treated by E.C.T. than in cases treated conservatively.

(b) In many cases discharged "Recovered" in the treated group, the long period which intervened between cessation of treatment and ultimate discharge made it seem doubtful whether convulsive therapy had, in fact, been a contributing factor. However, such recoveries have, of course, necessarily been attributed to E.C.T. in the present analysis.

(2) *The Duration of Hospitalization.*

The use of E.C.T. does not seem to reduce the period of hospitalization to any significant degree.

(3) *Frequency of Readmissions.*

In this study this was found to depend on the following two factors:

(a) *The length of the chronological period through which the patient can be traced.* One of the notable findings in this survey is the fallacy of adjudging prognosis on a short-term basis without adequate follow-up. Time and time again it was demonstrated that patients discharged "Recovered," and given an excellent prognosis, were admitted with a second depressive illness one, two, three or more years later. Then, again, after an apparently satisfactory recovery, he or she would return on a later occasion. In short, it was found that no matter what the prognostic assessment on discharge, after the passage of one year the number of relapses bears a direct relationship to the chronological period during which the patient is followed-up. (Depression recurring within a year of discharge comes into a different category, since here the

TABLE I.—*Summary of 608 Female Cases.**Total Number of Hospitalizations Studied—1,054.**Treated Conservatively. (834 hospitalizations.)**1900-39. (First female control group—FC1—470 hospitalizations.)*

Re-covered.	Improved.	Not improved.	Died.	Total.	
141	99	26	45	311	1st hospitalization.
46	28	10	9	93	2nd "
16	10	3	8	37	3rd "
8	3	1	2	14	4th "
3	2	1	—	6	5th "
1	2	—	—	3	6th "
1	1	—	—	2	7th "
1	—	—	—	1	8th "
1	—	—	—	1	9th "
1	—	—	—	1	10th "
1	—	—	—	1	11th "
220	145	41	64	470	
46.8%	30.9%	8.7%	13.6%		
220	145	41	—	406	(Excluding deaths.)
54.3%	35.6%	10.1%			

1940-49. (Second female control group—FC2—364 hospitalizations.)

Re-covered.	Improved.	Not improved.	Died.	Total.	
77	43	27	24	171	1st hospitalization.
31	30	25	5	91	2nd "
17	19	9	3	48	3rd "
7	8	5	1	21	4th "
9	3	3	2	17	5th "
1	3	3	1	8	6th "
—	2	2	—	4	7th "
1	1	1	—	3	8th "
—	1	—	—	1	12th "
143	110	75	36	364	
39.3%	30.2%	20.6%	9.9%		
143	110	75	—	328	(Excluding deaths.)
43.6%	33.5%	22.9%			

1900-49. (Total of FC1 and FC2 with the exclusion of deaths.)

Re-covered.	Improved.	Not improved.	Died.	Total.
363	255	116	—	734
49.5%	34.7%	15.8%		

*Treated with E.C.T. (220 hospitalizations.)**1940-49. (Female treated—FT.)*

Re-covered.	Improved.	Not improved.	Died.	Total.	
74	32	18	2	126	1st hospitalization.
28	16	11	1	56	2nd "
9	6	3	—	18	3rd "
8	2	1	—	11	4th "
1	1	1	—	3	5th "
1	2	—	—	3	6th "
2	—	—	—	2	7th "
1	—	—	—	1	8th "
124	59	34	3	220	
56.4%	26.8%	15.4%	1.4%		
124	59	34	—	217	(Excluding deaths.)
57.1%	27.2%	15.7%			

TABLE II.—*Summary of 315 Male Cases.**Total Number of Hospitalizations Studied—557.**Treated Conservatively. (459 hospitalizations.)**1911-39. (First male control group—MC1—277 hospitalizations.)*

Re-covered.	Improved.	Not improved.	Died.	Total.	
66	66	16	30	178	1st hospitalization.
24	20	3	11	58	2nd "
12	8	2	1	23	3rd "
5	3	2	2	12	4th "
1	2	—	—	3	5th "
1	2	—	—	3	6th "

109	101	23	44	277
39.3%	36.5%	8.3%	15.9%	

109	101	23	—	233	(Excluding deaths.)
46.8%	43.3%	9.9%			

1940-49. (Second male control group—MC2—182 hospitalizations.)

Re-covered.	Improved.	Not improved.	Died.	Total.	
28	30	8	19	85	1st hospitalization.
12	17	6	7	42	2nd "
8	7	3	1	19	3rd "
4	4	5	2	15	4th "
3	3	2	—	8	5th "
—	2	2	1	5	6th "
—	1	—	2	3	7th "
—	1	1	—	2	8th "
—	1	—	1	2	9th "
—	—	1	—	1	10th "

55	66	28	33	182
30.2%	36.3%	15.4%	18.1%	

55	66	28	—	149	(Excluding deaths.)
36.9%	44.3%	18.8%			

1911-49. (Total of MC1 and MC2 with the exclusion of deaths.)

Re-covered.	Improved.	Not improved.	Died.	Total.
164	167	51	—	382
43.0%	43.7%	13.3%		

*Treated with E.C.T. (98 hospitalizations.)**1940-49. (Male treated—MT.)*

Re-covered.	Improved.	Not improved.	Died.	Total.	
28	19	5	—	52	1st hospitalization.
11	9	1	2	23	2nd "
5	4	3	—	12	3rd "
2	3	—	—	5	4th "
1	—	2	—	3	5th "
2	—	—	—	2	6th "
—	1	—	—	1	7th "

49	36	11	2	98
50.0%	36.7%	11.2%	2.1%	

49	36	11	—	96	(Excluding deaths.)
51.0%	37.5%	11.5%			

TABLE III.—*Distribution of Cases per Year of Admission.*
Females—1st Hospitalization.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1930	44	12	4	2	62
31	5	2	—	—	7
32	6	4	1	7	18
33	7	9	2	4	22
34	10	8	1	2	21
35	9	6	4	6	25
36	12	15	5	4	36
37	8	9	4	7	28
38	14	18	2	4	38
39	26	16	3	9	54
	141	99	26	45	311
	45.3%	31.8%	8.4%	14.5%	

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1940	18	11	4	7	40
41	14	7	—	5	26
42	9	5	7	2	23
43	8	7	1	3	19
44	7	4	3	2	16
45	8	5	2	1	16
46	7	1	7	2	17
47	6	3	3	2	14
	77	43	27	24	171
	45.0%	25.2%	15.8%	14.0%	
Total	218	142	53	69	482
	45.2%	29.5%	11.0%	14.3%	

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1940	7	3	3	—	13
41	10	2	1	1	14
42	11	5	—	—	16
43	7	2	5	—	14
44	4	4	—	—	8
45	2	6	1	—	9
46	11	5	3	—	19
47	18	4	5	1	28
48	4	1	—	—	5
	74	32	18	2	126
	58.7%	25.4%	14.3%	1.6%	

Excluding Deaths from the Above Tables.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Total.
1900-39	141	99	26	266
	53.0%	37.2%	9.8%	
1940-48	77	43	27	147
	52.4%	29.2%	18.4%	
Total	218	142	53	413
	52.8%	34.4%	12.8%	

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Total.
1940-48	74	32	18	124
	59.7%	25.8%	14.5%	

question arises whether the alleged recurrence is but another phase of the original depressive illness. The figures demonstrate that cases discharged "Improved" have a greater tendency to return to hospital during this period than cases discharged "Recovered," and that cases discharged "Recovered" after E.C.T. show a higher incidence of readmission than "Recovered" cases in the control groups.

(b) *Number of previous admissions.* — The percentage of relapse increases *pari passu* with every subsequent readmission.

TABLE IV.—*Distribution of Cases per Years of Admission.*

Males—1st Hospitalization.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1911-39 .	66 37.0%	66 37.0%	16 9.0%	30 17.0%	178
1940-48 .	28 32.9%	30 35.3%	8 9.4%	19 22.4%	85
Total .	94 35.7%	96 36.5%	24 9.1%	49 18.7%	263

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1940-48 .	28 53.8%	19 36.6%	5 9.6%	—	52

Excluding Deaths from the Above Tables.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Total.
1911-39 .	66 44.6%	66 44.6%	16 10.8%	148
1940-48 .	28 42.4%	30 45.5%	8 12.1%	66
Total .	94 43.9%	96 44.9%	24 11.2%	214

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Total.
1940-48 .	28 53.8%	19 36.6%	5 9.6%	52

Tables III and IV show that the percentage rate of cases discharged "Recovered" is higher in the treated patients than in the controls. Conversely, the percentage rate of cases discharged "Improved" is higher in the controls. When the two, "Recovered" and "Improved," are added together the sum total is almost identical for the control and treated groups. The difference is so slight as to be statistically insignificant.

TABLE V.—*Distribution According to Age Grouping.*
*Female—1st Hospitalization.**Treated Conservatively.*

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1900-39	12	27	40	32	25	5	141	Recovered.
"	3	15	25	32	17	7	99	Improved.
"	—	3	7	12	4	—	26	Not improved.
"	—	1	4	17	17	6	45	Died.
Total	15	46	76	93	63	18	311	
	4.9%	14.8%	24.5%	29.9%	20.1%	5.8%		
1940-48	1	11	23	17	17	8	77	Recovered.
"	2	9	9	9	13	1	43	Improved.
"	—	1	4	11	7	4	27	Not improved.
"	—	—	2	6	8	8	24	Died.
Total	3	21	38	43	45	21	171	
	1.7%	12.3%	22.2%	25.2%	26.3%	12.3%		

Grand Total.

1900-48	18	67	114	136	108	39	482
	3.7%	13.9%	23.7%	28.2%	22.4%	8.1%	

Treated with E.C.T.

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1940-48	2	11	13	33	12	3	74	Recovered.
"	3	14	5	5	3	2	32	Improved.
"	—	1	7	6	4	—	18	Not improved.
"	—	—	—	1	1	—	2	Died.
	5	26	25	45	20	5	126	
	4.0%	20.6%	19.8%	35.7%	15.9%	4.0%		

TABLE VI.—*Distribution According to Age Grouping.*
*Males—1st Hospitalization.**Treated Conservatively.*

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1911-39	3	14	7	24	16	2	66	Recovered.
"	4	5	15	21	15	6	66	Improved.
"	—	1	5	4	5	1	16	Not improved.
"	—	—	2	5	17	6	30	Died.
Total	7	20	29	54	53	15	178	
	3.9%	11.2%	16.3%	30.4%	29.8%	8.4%		
1940-48	1	2	5	7	8	5	28	Recovered.
"	1	3	1	7	12	6	30	Improved.
"	—	—	2	1	2	3	8	Not improved.
"	—	—	1	3	7	8	19	Died.
Total	2	5	9	18	29	22	85	
	2.3%	5.9%	10.6%	21.2%	34.1%	25.9%		

Grand Total.

1911-48	9	25	38	72	82	37	263
	3.4%	9.5%	14.5%	27.3%	31.2%	14.1%	

Treated with E.C.T.

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1940-48	5	5	4	8	3	3	28	Recovered.
"	—	—	7	8	3	1	19	Improved.
"	—	—	1	4	—	—	5	Not improved.
Total	5	5	12	20	6	4	52	
	9.6%	9.6%	23.1%	38.5%	11.5%	4.7%		

TABLE VII.—*Duration of Hospitalization.**Females—1st Hospitalization.**Treated with E.C.T., 1940-48.**Recovered—74/124 = 59.7%.*

Weeks.	Total No.	Average of weeks.	Percentage of total.
0- 9	12	8	9.7
10-19	22	15	17.7
20-29	12	24	9.7
30-39	7	33	5.7
50-59	1	51	0.8
60-69	7	67	5.7
70-79	2	71	1.6
80-89	3	86	2.4
100-09	2	107	1.6
110-19	1	112	0.8
120-29	2	123	1.6
130-39	1	131	0.8
140-49	1	141	0.8
330-39	1	339	0.8

74

Improved—32/124 = 25.8%.

Weeks.	Total No.	Average of weeks.	Percentage of total.
0- 9	11	6	8.9
10-19	5	14	4.0
20-29	9	23	7.3
30-39	2	38	1.6
50-59	1	50	0.8
60-69	1	61	0.8
110-19	1	113	0.8
210-19	1	212	0.8
310-19	1	311	0.8

32

Not improved—18/124 = 14.5%.

Weeks.	Total No.	Average of weeks.	Percentage of total.
20-29	2	26	1.6
40-49	1	46	0.8
60-69	1	60	0.8
300-19	1	319	0.8
	13	(still in hospital)	10.5

18

Therefore, the total number of patients discharged equals the sum of total of 74, 32, 5 = 111.

TABLE VIII.—*Duration of Hospitalization Before and After E.C.T. Treatment.**Females—1st Hospitalization.**Recovered*— $74/124 = 59.7\%$ (average number of convulsions, 7.2).*Duration Before Treatment.*

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	41	4.0	55.4
10-19	17	13.3	23.0
20-29	3	25.0	4.0
30-39	2	30.5	2.7
50-59	4	53.2	5.4
Over 53	7	Over 1 year	9.5
74			

Duration After Treatment.

Weeks.	Total No.	Average of weeks.	Percentages.
0-9	51	4.5	68.9
10-19	11	13.6	14.9
20-29	3	23.0	4.1
30-39	2	35.0	2.7
40-49	1	48.0	1.3
50-59	3	55.3	4.1
Over 104	3	Over 2 years	4.1
74			

Improved— $32/124 = 25.8\%$ (average number of convulsions, 6.9).*Duration Before Treatment.*

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	20	4.2	62.4
10-19	5	11.6	15.6
20-29	2	21.0	6.3
30-39	2	34.0	6.3
80-89	1	89.0	3.1
?	2	?	6.3
32			

Duration After Treatment.

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	23	3.3	71.9
10-19	1	10.0	3.1
20-29	1	21.0	3.1
30-39	1	39.0	3.1
40-49	1	48.0	3.1
50-59	1	55.0	3.1
Over 156	2	Over 3 years	6.2
?	2	?	6.2
32			

TABLE IX.—*Duration of Hospitalization Before and After E.C.T. Treatment.**Males—1st Hospitalization.**Recovered*—28/52 = 53·8% (average number of convulsions, 6·9).*Duration Before Treatment.*

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	16	4·4	57·1
10-19	4	13·5	14·3
20-29	4	23·5	14·3
40-49	1	41·0	3·6
60-69	1	62·0	3·6
100-09	1	108·0	3·6
?	1	?	3·6
—			
28			

Duration After Treatment.

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	18	4·3	64·3
10-19	3	15·6	10·7
20-29	4	25·0	14·3
40-49	1	48·0	3·6
50-59	1	51·0	3·6
?	1	?	3·6
—			
28			

Improved—19/52 = 36·6% (average number of convulsions, 6·9).*Duration Before Treatment.*

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	11	4·1	57·9
10-19	4	12·5	21·0
20-29	1	20·0	5·3
190-99	1	197·0	5·3
?	2	?	10·5
—			
19			

Duration After Treatment.

Weeks.	Total No.	Average of weeks.	Percentage.
0-9	11	4·7	57·9
10-19	5	14·8	26·3
90-99	1	97·0	5·3
?	2	?	10·5
—			
19			

TABLE X.—*Duration of 1st Intermission.**Females—Treated with E.C.T.—1940-48.*

Total number of cases readmitted—35/III = 31.5%.

" " relapsed —48/III = 43.2%.*

Cases discharged "Recovered" —21/III = 18.9%.

27/III = 24.3%.

Readmitted.

Relapsed.

Weeks.	Total No.	Average of weeks.	Average per year.	Percentage of total.
0- 9	1	2.0	0.04	0.9
10- 19	4	13.7	0.26	3.6
20- 29	3	26.0	0.50	2.7
30- 39	2	33.5	0.60	1.8
40- 49	1	42.0	0.80	0.9
50- 59	1	55.0	1.06	0.9
70- 70	1	70.0	1.30	0.9
80- 89	1	87.0	1.70	0.9
90- 99	1	95.0	1.80	0.9
100-109	2	105.5	2.03	1.8
150- 59	1	153.0	3.00	0.9
160- 69	1	163.0	3.10	0.9
230- 39	1	237.0	4.60	0.9
260- 69	1	260.0	5.00	0.9

21

Cases discharged "Improved"—14/III = 12.6%.

18/III = 16.3%.

Readmitted.

Relapsed.

Weeks.	Total No.	Average of weeks.	Average per year.	Percentage of total.
0- 9	2	5.0	0.10	1.8
10-19	3	11.7	0.20	2.7
20-29	4	26.0	0.50	3.6
40-49	1	42.0	0.80	0.9
50-59	1	54.0	1.04	0.9
60-69	1	60.0	1.10	0.9
140-49	1	147.0	2.80	0.9
250-59	1	255.0	4.90	0.9

14

Cases discharged "Not Improved"—0/III.

Readmitted.

3/III. Relapsed.

* The above percentage refers to patients who were readmitted, including patients who relapsed but were not readmitted.

Analysis of Patients who Relapsed but were not Readmitted.

In "discharged Recovered" group—3 committed suicide after 1, 16, 28 weeks.

—3 relapsed after 52, 52, 30 weeks.

In "discharged Improved" group—4 relapsed within first year.

" Not Improved" " —2 committed suicide after 1, 4 weeks.

—1 still at home.

The age distribution curve is very similar whatever the admission period under review. The peak occurs in the age-groups 46-55 years (Figs. 1-4).

When the age distribution curve is considered in relation to control and treated groups, a slight shift to the left in the curve for the treated cases indicates that the patients in this group were, on the average, slightly younger—compare Figs. 7, 8 with Figs. 5, 6.

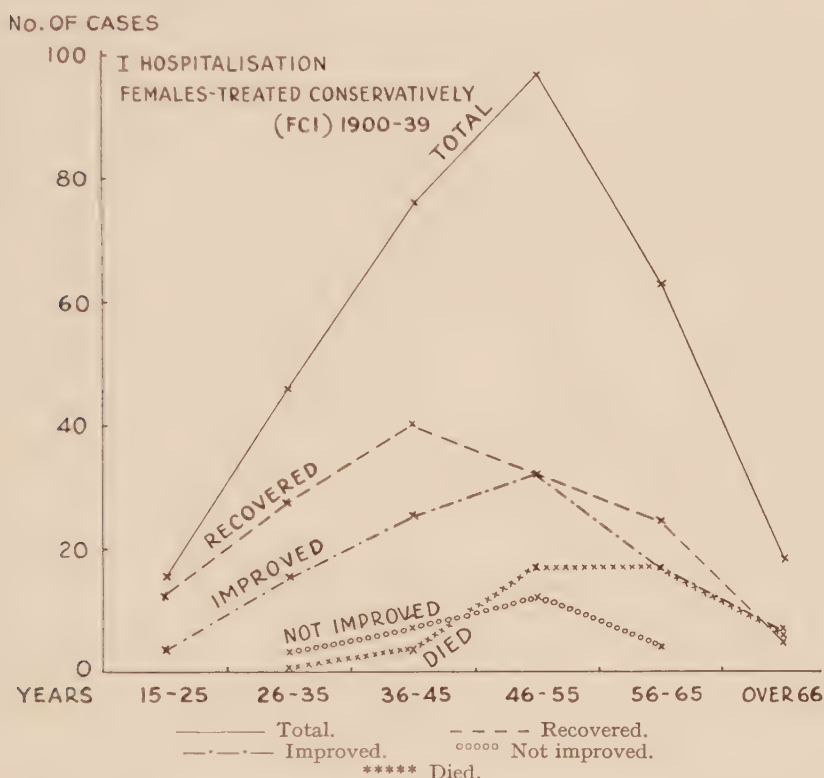


FIG. 1.—The above figure shows the age distribution on first hospitalization of the female patients who were treated conservatively between the years 1900-39. This is the first female control group (FCI).

Peak age distribution in total = 46-55 years.
 " " " Recovered " = 36-45 "
 " " " Improved " = 46-55 "

The percentage of readmissions, when calculated on the total number of cases discharged, shows that the "Recovered" had a higher percentage than the "Improved." But if the percentage of readmissions were calculated within each group separately, it will be shown that patients discharged "Improved" had a higher rate of readmission as compared to the "Recovered."

As shown in Tables VII and X, of the 74 patients discharged "Recovered," 21 or 28.3 per cent were readmitted. Thirty-two patients discharged "Improved," 14 or 43.7 per cent., were readmitted. The figures would be slightly higher if they included patients who relapsed but were not readmitted. Furthermore, this increase is greatest in the first year after discharge.

It has to be pointed out that the foregoing methods of analysis, as shown in Tables III, V, VII, VIII and X, have been applied to *all* hospitalizations, but space does not permit of the presentation of the mass of detailed calculations involved. It is only possible to present in the following pages the percentages obtained for *first* and *second* hospitalizations.

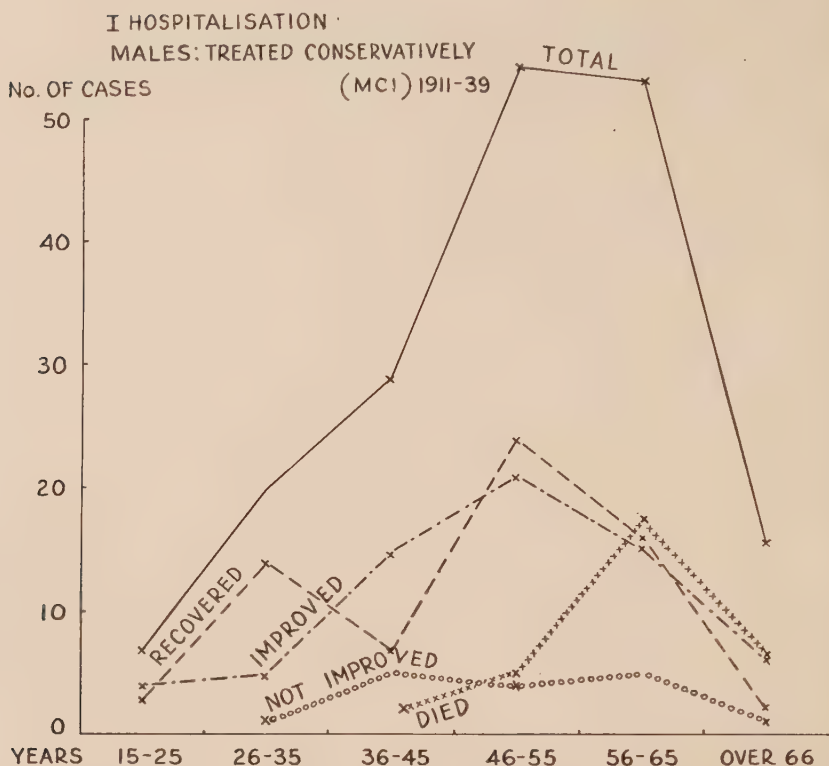


FIG. 2.—The above figure shows the age distribution on first hospitalization of the male patients who were treated conservatively between the years 1911-39. This is first male control group. (MC1).

Peak age distribution in total = 46-55 years.
 " " "Recovered" = 46-55 "
 " " "Improved" = 46-55 "

Duration of 1st Hospitalization.

Expressed in Terms of Percentage of Total.

Patients Discharged "Recovered" or "Improved" within Two Months.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	9.7	10.3	20.0	MC1 %	9.4	14.2	23.6
FC2 %	21.7	11.4	33.1	MC2 %	25.8	12.1	37.9
FT %	9.7	8.9	18.6	MT %	3.9	3.9	7.8

At the end of two months the percentage of "Recovered" and "Improved" is greater in the control groups than in the group treated with E.C.T.

Patients Discharged "Recovered" or "Improved" within Three Months.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	28.7	22.3	51.0	MC1 %	26.3	24.3	50.6
FC2 %	33.9	20.3	54.2	MC2 %	31.9	27.3	59.2
FT %	27.4	12.9	40.3	MT %	21.2	15.4	36.6

At the end of three months the percentage of "Recovered" and "Improved" remains greater in the control groups.

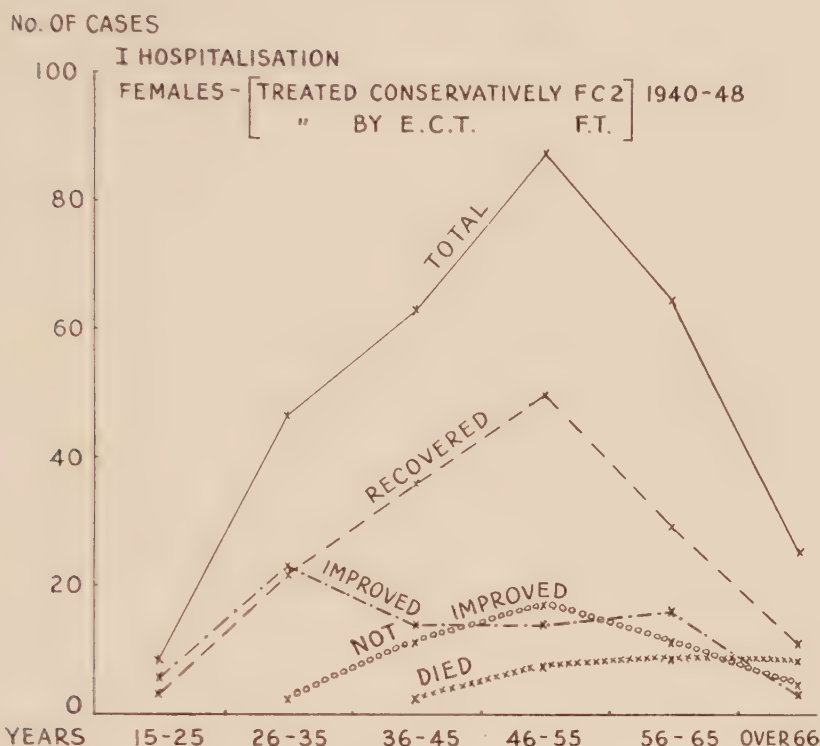


FIG. 3.—The above figure shows the age distribution on first hospitalization of all the female patients, regardless of the method of treatment given, between the years 1940-48. Second female control group plus treated group (FC2 and FT).

Peak age distribution in total = 46-55 years.

" " " Recovered " = 46-55 "

" " " Improved " = 26-35 "

Patients Discharged " Recovered " or " Improved " within Six Months.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	34.7	27.9	62.6	MC1 %	31.8	29.8	61.6
FC2 %	39.3	22.3	61.6	MC2 %	34.9	33.4	68.3
FT %	37.1	20.2	57.3	MT %	30.8	26.9	57.7

By the end of six months the percentage of " Recovered " and " Improved " maintains its slight superiority in the control group.

Patients Discharged " Recovered " or " Improved " within First Year.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	43.9	31.7	75.6	MC1 %	37.2	40.0	77.2
FC2 %	48.2	27.8	76.0	MC2 %	40.9	40.9	81.8
FT %	43.6	22.6	66.2	MT %	42.3	32.7	75.0

At the end of twelve months the percentage of " Recovered " and " Improved " is still slightly higher in the control groups, a seeming increase in male " Recovered " cases being offset by a decrease in the percentage of male cases " Improved."

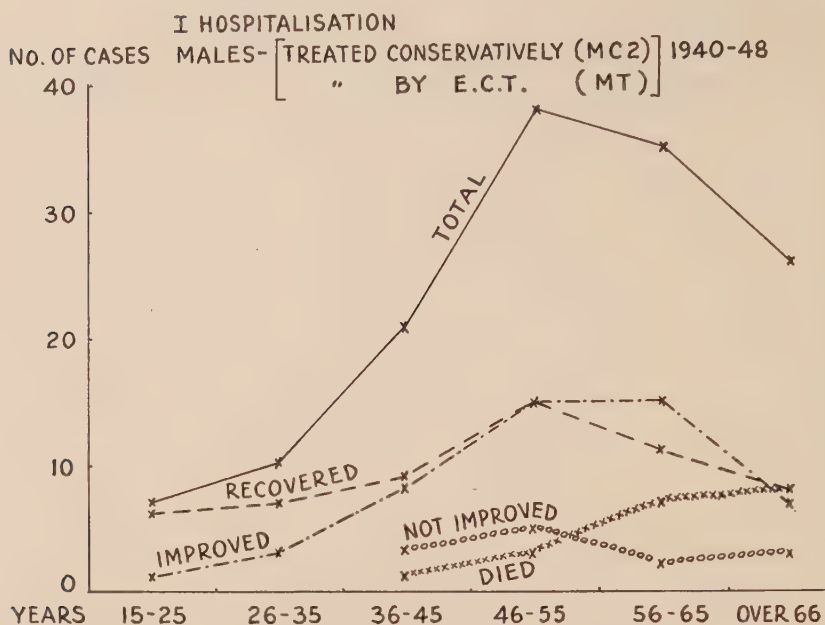


FIG. 4.—The above figure shows the age distribution on first hospitalization of *all* the male patients, regardless of the methods of treatment given, between the years 1940-48. Second male control group plus treated group (MC2 and MT).

Peak age distribution in total = 46-55 years.

" " "Recovered" = 46-55 "

" " "Improved" = 46-55 and 56-65 years.

Patients Discharged "Recovered" or "Improved" within Two Years.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	48.1	33.2	81.3	MC1 %	39.9	43.3	83.2
FC2 %	50.3	28.5	78.8	MC2 %	40.9	43.9	84.8
FT %	54.9	23.4	78.3	MT %	50.0	34.6	84.6

By the end of two years there is, for the first time, a definite increase in the percentage of "Recovered" cases in the group treated by E.C.T. However, the percentage of cases discharged "Improved" in this group falls far short of the number of "Improved" cases in the control groups, so that the sum total of "Recovered" and "Improved" for both control and treated groups is almost identical.

Patients Discharged "Recovered" or "Improved" within Three Years.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	49.7	34.8	84.5	MC1 %	40.6	44.0	84.6
FC2 %	50.3	29.2	79.5	MC2 %	42.4	45.5	87.9
FT %	58.9	24.2	83.1	MT %	53.8	34.6	88.4

By the end of three years the female and male treated groups show a slightly increased percentage of "Recovered" cases, but the percentage of "Improved" is lower than in control groups.

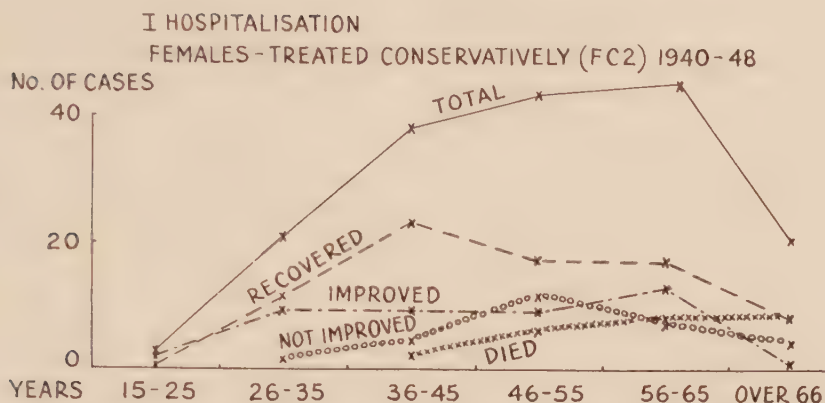


FIG. 5.—The above figure shows the age of distribution on first hospitalization of female patients who were treated conservatively between the years 1940-48. This is second female control group (FC2).

Peak age distribution in total = 56-65 years.

" " " Recovered " = 46-55 "

" " " Improved " = 56-65 "

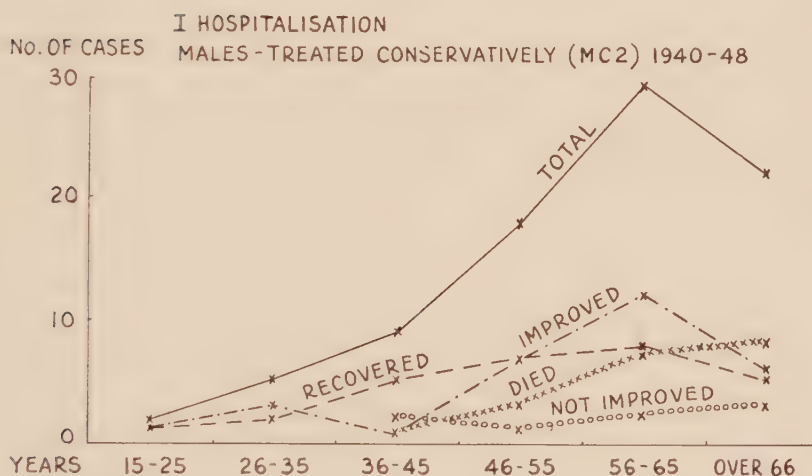


FIG. 6.—The above figures shows the age distribution on first hospitalization of male patients who were treated conservatively between the years 1940-48. This is second male control group (MC2).

Peak age distribution in total = 56-65 years.

" " " Recovered " = 56-65 "

" " " Improved " = 56-65 "

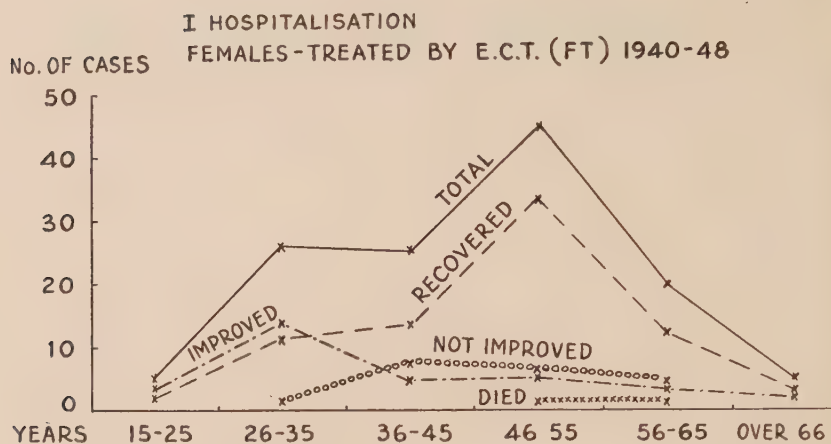


FIG. 7.—The above figure shows the age distribution on first hospitalization of the female patients who were treated with E.C.T. between the years 1940-48. This is female treated group (FT).

Peak age distribution in total = 46-55 years.

" " " Recovered " = 46-55 "

" " " Improved " = 26-35 "

Note the few cases that were treated in the age group 56-65, and over 66, as compared to the control group for the same period in Fig. 5.

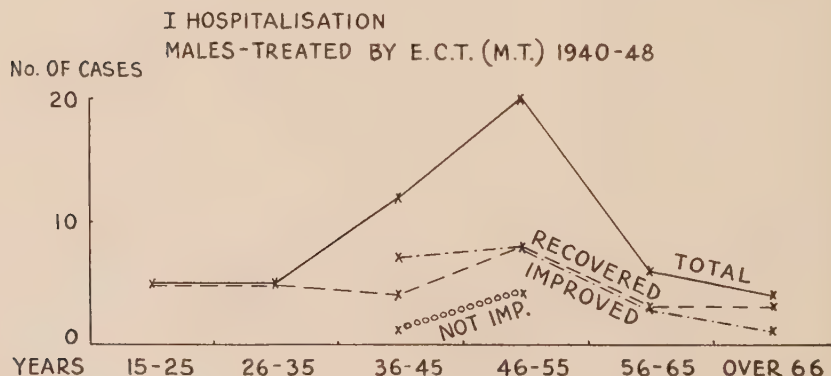


FIG. 8.—The above figure shows the age distribution on first hospitalization of male patients who were treated with E.C.T. between the years 1940-48. This is male treated group (MT).

Peak age distribution in total = 46-55 years.

" " " Recovered " = 46-55 "

" " " Improved " = 46-55 "

Note the few cases that were treated with E.C.T. in the age group 56-65, and over 66 years, as compared to the control group (MC2) for the same period in Fig. 6.

Patients Discharged "Recovered" or "Improved" within Four Years or More.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	53.0	37.2	90.2	MC1 %	44.6	44.6	89.2
FC2 %	52.4	29.2	81.6	MC2 %	42.4	45.5	87.9
FT %	59.7	25.8	85.5	MT %	53.8	36.6	90.4

The Longest Period of Hospitalization has been as Follows :

	Rec. (years).	Imp. (years).		Rec. (years).	Imp. (years).
FC1 . .	17.4	8.8	MC1 . .	7.2	6.1
FC2 . .	7.0	2.7	MC2 . .	2.5	2.9
FT . .	6.5	6.0	MT . .	2.6	4.0

By the end of four years the first female control group (FC1) shows 53 per cent. "Recovered" and 37.2 per cent. "Improved," giving a total of 90.2 per cent. discharged. Female treated group (FT) shows 59.7 per cent. "Recovered" and 25.8 per cent. "Improved," giving a total of 85.5 per cent. discharged. The first male control group (MC1) shows 44.6 per cent. "Recovered" and 44.6 per cent. "Improved," giving a total of 89.2 per cent. discharged. Male treated (MT) group shows 53.8 per cent. "Recovered" and 36.6 per cent. "Improved," giving a total of 90.4 per cent. discharged.

This analysis of the rate of recovery in first hospitalization in relationship to the time factor shows clearly that E.C.T. does not increase the rate of discharge from hospital, nor does it shorten the duration of hospitalization.

Duration of 1st Intermission.

Expressed in Terms of Percentage of Total.

Percentage Rate of Relapse.

The percentage of readmissions is calculated on the total number of cases discharged from hospital, the number of patients who die or remain in hospital having been subtracted from the original first admissions.

(a) The total percentage of relapse increases steadily with subsequent readmissions, regardless of the method of treatment given. Below is a tabulation of patients who were readmitted :

				Number of hospitalizations.			
				I.	II.	III.	IV.
FC1	—total percentage readmitted	.	.	58.7	65.4	69.2	90.9
FC2	— " " "	.	.	43.4	48.6	48.7	50.0
FT	— " " "	.	.	31.5	39.1	66.6	70.0
MC1	— " " "	.	.	63.2	65.9	81.0	80.0
MC2	— " " "	.	.	29.0	40.6	66.6	30.0
MT	— " " "	.	.	30.0	47.6	45.5	50.0

If the number of relapses in patients who did not return to hospital is also included, the figures are considerably higher.

				Number of hospitalizations.			
				I.	II.	III.	IV.
FC1	—total percentage of relapse	.	.	62.2	69.2	69.2	90.9
FC2	— " " "	.	.	48.0	52.8	54.0	73.3
FT	— " " "	.	.	43.2	47.8	66.6	70.0
MC1	— " " "	.	.	63.2	65.9	81.0	80.0
MC2	— " " "	.	.	29.0	40.6	66.6	30.0
MT	— " " "	.	.	36.1	52.3	45.5	66.6

In the above tabulation the first female and male control groups (FC1 and MC1) have a higher percentage of relapse per readmission as compared to the second control group (FC2 and MC2) and the group treated with E.C.T. (FT and MT).

This does not imply that the rate of relapse is greater in the first control group, for it will be shown later that this increase is dependent on the length of time which has intervened since the patient's discharge. The first control group has been studied over a longer period of time than the second control and treated groups.

(b) *The total percentage of relapse increases with the length of time since discharge.*

Duration of 1st Intermission.

*Percentage of Readmission within Six Months of Discharge
"Recovered" or "Improved."*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	5.2	8.6	13.8	MC1 %	7.0	8.3	15.3
FC2 %	6.1	6.9	13.0	MC2 %	4.8	11.2	16.0
FT %	7.2	8.1	15.3	MC %	12.8	8.6	21.4

The majority of cases discharged "Improved" have a greater rate of relapse than cases discharged "Recovered." This is in accordance with the clinical expectation. It is only natural to find patients who had made partial recovery relapse sooner, within the first six months, than patients who had made a complete recovery. There is one exception: the males treated (MT) show a greater percentage of relapse in cases discharged "Recovered" than in cases discharged "Improved."

In female and male patients treated with E.C.T. (FT and MT) the percentage of relapse in cases discharged "Recovered" is greater than in either of the control groups. If to this is added the patients who relapsed but did not return to hospital, the numbers are proportionately greater. This is the evidence for the statement made previously that E.C.T. probably induces in some cases a false sense of well-being. In this state of mild euphoria the patient tends to assert his sense of well-being and demands to be discharged. This mood is short lived, hence the greater tendency to relapse of treated cases in the first six months after discharge as compared to cases that recovered spontaneously.

*Percentage of Readmission within One Year of Discharge
"Recovered" or "Improved."*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	9.9	11.8	21.7	MC1 %	7.0	11.1	18.1
FC2 %	11.5	10.0	21.5	MC2 %	6.4	11.2	17.6
FT %	9.9	9.0	18.9	MT %	12.8	8.6	21.4

The percentage of relapse within one year is very close in all the groups.

*Percentage of Readmission within Two to Five Years of
Discharge "Recovered" or "Improved."*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	19.5	17.4	36.9	MC1 %	14.0	17.4	31.4
FC2 %	23.0	16.3	39.3	MC2 %	6.4	17.6	24.0
FT %	18.9	12.6	31.5	MC %	19.2	10.7	29.8

The reader is reminded at this juncture that only a limited number of patients treated during the period 1940-48 have fulfilled the requisite time limit of five years. Yet all the patients in the chronological period of 1900-39 have been discharged for more than five years. It is for this reason FT and MT and FC2 and MC2 show a lower percentage of relapse.

*Percentage of Readmission within Six to Ten Years of
Discharge "Recovered" or "Improved."*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	27.5	21.0	48.5	MC1 %	21.0	25.8	46.8
FC2 %	24.0	17.9	41.9	MC2 %	8.0	17.8	25.8
FT %	—	—	—	MC %	—	—	—

By the end of six years there is no increase in the total percentage of relapse in FT and MT, as most of them have not been out of hospital for six to ten years. This brings out clearly, for reasons mentioned in the above paragraph, the steady increase of the percentage of relapse in FC1 and MC1 as compared with FC2 and MC2.

Percentage of Readmission within Eleven to Thirty-four Years of Discharge "Recovered" or "Improved."

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	33.9	22.9	56.8	MC1 %	31.9	29.2	61.1
FC2 %	—	—	—	MC2 %	—	—	—
FT %	—	—	—	MC %	—	—	—

The longest period of intermission has been as follows:

	Rec. (years).	Imp. (years).		Rec. (years).	Imp. (years).
FC1	26.9	17.5	MC1	33.7	16.7
FC2	6.6	7.5	MC2	6.7	3.8
FT	5.0	4.9	MC	4.5	2.4
FT	5.0	4.9	MC	4.5	2.4

To reiterate, the percentage of relapse increases directly with the length of the chronological period since discharge. The first control group (FC1 and MC1) having been discharged for a longer period of time, the rate of relapse is greater in this group than in FC2 and MC2, FT and MT.

TABLE XI.—*Distribution of Cases per Years of Admission.*

Females—2nd Hospitalization.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1900-39	46 49.5%	28 30.1%	10 10.7%	9 9.7%	93
1940-49	31 34.0%	30 33.0%	25 27.5%	5 5.5%	91
Total	77 41.9%	58 31.4%	35 19.1%	14 7.6%	184

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1940-49	28 50.0%	16 28.6%	11 19.6%	1 1.8%	56

Excluding Deaths from the Above Tables.

Treated Conservatively.

Year.	Recovered.	Improved.	Not improved.	Total
1900-39	46 54.8%	28 33.3%	10 11.9%	84
1940-49	31 36.1%	30 34.9%	25 29.0%	86
Total	77 45.3%	58 34.1%	35 20.6%	170

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Total.
1940-49	28 50.9%	16 29.1%	11 20.0%	55

TABLE XII.—*Distribution According to Age Grouping.**Treated Conservatively.*

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1900-39	2	8	10	13	8	5	46	Recovered.
"	1	5	4	12	4	2	28	Improved.
"	—	2	1	3	1	3	10	Not improved.
"	—	—	—	4	2	3	9	Died.
Total	3	15	15	32	15	13	93	
	3.3%	16.1%	16.1%	34.4%	16.1%	14.0%		
1940-48	—	7	5	8	11	—	31	Recovered.
"	3	4	7	7	8	1	30	Improved.
"	—	5	5	4	6	5	25	Not improved.
"	—	—	—	3	1	1	5	Died.
Total	3	16	17	22	26	7	91	
	3.3%	17.6%	18.7%	24.1%	28.5%	7.8%		

Grand Total.

1940-48	6	31	32	54	41	20	184
	3.3%	16.8%	17.4%	29.4%	22.3%	10.8%	

Treated with E.C.T.

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1940-49	2	3	3	10	9	1	28	Recovered.
"	—	5	4	4	2	1	16	Improved.
"	—	1	3	4	3	—	11	Not improved.
"	—	—	—	—	—	1	1	Died.
Total	2	9	10	18	14	3	56	
	3.6%	16.0%	17.9%	32.1%	25.0%	5.4%		

TABLE XIII.—*Distribution of Cases per Years of Admission.**Males—2nd Hospitalization.**Treated Conservatively.*

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1916-39	24 41.4%	20 34.5%	3 5.2%	11 18.9%	58
1940-49	12 28.7%	17 40.4%	6 14.3%	7 16.6%	42
Total	36 36.0%	37 37.0%	9 9.0%	18 18.0%	100

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Died.	Total.
1940-49	11 47.8%	9 39.1%	1 4.4%	2 8.7%	23

*Excluding Deaths from the Above Tables.**Treated Conservatively.*

Year.	Recovered.	Improved.	Not improved.	Total.
1916-39	24 51.0%	20 42.6%	3 6.4%	47
1940-49	12 34.3%	17 48.6%	6 17.1%	35
Total	36 43.9%	37 45.1%	9 11.0%	82

Treated with E.C.T.

Year.	Recovered.	Improved.	Not improved.	Total.
1940-49	11 52.4%	9 42.8%	1 4.8%	21

TABLE XIV.—*Distribution According to Age Grouping.**Males—2nd Hospitalization.**Treated Conservatively.*

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1916-39	1	1	3	8	10	1	24	Recovered.
"	—	3	—	8	7	2	20	Improved.
"	—	—	—	—	1	2	3	Not improved.
"	—	1	—	2	4	4	11	Died.
Total	1 1.7%	5 8.6%	3 5.2%	18 31.0%	22 38.0%	9 15.5%	58	
1940-49	—	—	4	2	4	2	12	Recovered.
"	—	—	1	4	5	7	17	Improved.
"	—	1	1	1	—	3	6	Not improved.
"	—	—	—	—	3	4	7	Died.
Total	—	1 2.4%	6 14.3%	7 16.6%	12 28.6%	16 38.1%	42	

Grand Total.

1916-49	1 1.0%	6 6.0%	9 9.0%	25 25.0%	34 34.0%	25 25.0%	100
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Treated with E.C.T.

Age.	15-25.	26-35.	36-45.	46-55.	56-65.	Over 66.	Total.	State on discharge.
1940-49	—	—	4	2	3	2	11	Recovered.
"	—	—	3	3	3	—	9	Improved.
"	1	—	—	—	—	—	1	Not improved.
"	—	—	1	1	—	—	2	Died.
Total	1 4.3%	—	8 34.8%	6 26.1%	6 26.1%	2 8.7%	23	

*Duration of 2nd Hospitalization.**Expressed in Terms of Percentage of Total.**Patients Discharged "Recovered" or "Improved" within Two Months.*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	9.5	6.0	15.5	MC1 %	10.6	17.0	27.6
FC2 %	13.9	13.9	27.8	MC2 %	14.3	25.7	40.0
FT %	16.4	9.1	25.5	MT %	23.8	14.3	38.1

FT and MT show a relative increase over FC1 and MC1, but they do not exceed the second control group FC2 and MC2.

Patients Discharged "Recovered" or "Improved" within Three Months.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	26.1	13.1	39.2	MC1 %	31.9	31.9	63.8
FC2 %	26.6	23.2	49.8	MC2 %	28.6	37.1	55.7
FT %	32.8	20.0	52.8	MT %	38.1	19.1	57.2

FT and MT maintain the increase in the percentage of cases discharged "Recovered" as compared to the control groups, but the total percentage of cases discharged remains relatively equal. The male patients, as a group, show a higher percentage rate of discharge than female patients.

Patients Discharged "Recovered" or "Improved" within Six Months.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC ₁ %	36.8	15.5	52.3	MC ₁ %	38.3	34.0	72.3
FC ₂ %	27.8	24.4	52.2	MC ₂ %	31.5	42.8	74.3
FT %	40.1	21.8	61.9	MT %	38.1	19.1	57.2

FT shows for the first time a definite increase in cases discharged "Recovered" as well as in the percentage of the sum total of "Recovered" and "Improved." MT shows the rate of recovery to be similar to MC₁, and that the sum total of percentage of "Recovered" and "Improved" in MT is less than in the two control groups.

Patients Discharged "Recovered" or "Improved" within One Year.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC ₁ %	41.6	21.4	63.0	MC ₁ %	44.6	40.4	85.0
FC ₂ %	30.2	29.1	59.3	MC ₂ %	31.5	48.6	80.1
FT %	43.7	25.4	69.1	MT %	52.4	33.4	85.8

MT shows an increase in the percentage of "Recovered" as compared to MC₁ and MC₂, but the total percentage rate of discharged patients remains much the same. In FT the slight increase over FC₁ and FC₂ is maintained.

Patients Discharged "Recovered" or "Improved" within Two Years.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC ₁ %	47.6	28.5	76.1	MC ₁ %	46.7	40.4	87.1
FC ₂ %	34.9	31.4	66.3	MC ₂ %	31.5	48.6	80.1
FT %	43.7	27.2	70.9	MT %	52.4	42.8	95.2

The increased percentage in FT as compared to FC₁ at the end of first year as noted in the last paragraph is reversed by the end of two years, where FC₁ shows an increase in the percentage rate of cases discharged "Recovered," as well as in the total of "Recovered" and "Improved." In the case of males the percentage rate of discharge in MT is still higher than in MC₁ and MC₂ in cases discharged "Recovered" and "Improved."

Patients Discharged "Recovered" or "Improved" within Three Years.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC ₁ %	48.8	29.7	78.5	MC ₁ %	48.8	42.1	90.9
FC ₂ %	34.9	32.6	67.5	MC ₂ %	31.5	48.6	80.1
FT %	49.1	27.2	76.3	MT %	52.4	42.8	95.2

The male patients, as a group, show a higher percentage rate of discharge as compared to female patients.

Patients Discharged "Recovered" or "Improved" within Four Years or More.

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC ₁ %	54.8	33.3	88.1	MC ₁ %	51.0	42.1	93.1
FC ₂ %	36.1	34.9	71.0	MC ₂ %	34.3	48.6	82.9
FT %	50.9	29.1	80.0	MT %	52.4	42.8	95.2

The Longest Period of Hospitalization has been as follows:

	Rec. (years).	Imp. (years).		Rec. (years).	Imp. (years).
FC ₁ . .	9.6	5.0	MC ₁ . .	4.6	2.4
FC ₂ . .	3.3	4.9	MC ₂ . .	3.1	0.7
FT . .	3.1	3.8	MT . .	1.1	2.0

The second control groups (FC₂ and MC₂) show a definite decrease in percentage discharged "Recovered" following second hospitalization as compared to first

hospitalization. In the second female control group (FC2) the rate of "Recovered" is 52.4 per cent. in first hospitalization as compared to 36.1 per cent. in second hospitalization. In the second male control group (MC2) the rate of "Recovered" is 42.4 per cent. in first hospitalization as compared to 34.3 per cent. in second hospitalization. This lower rate of recovery in the second control group might be due to a greater selection of cases submitted to E.C.T. in second hospitalization. This brings out clearly the necessity of having the first control group where there was no selection. If, therefore, FT and MT were compared with FC2 and MC2, the conclusions drawn might be misleading. It is essential to compare FT and MT with FC1 and MC1, for they show that there is no difference between cases treated conservatively or with E.C.T., though a difference might be apparent if the comparison was made with FC2 and MC2 only.

Therefore, to claim any superiority for E.C.T., it is essential that the "Recovered" rate in the treated group exceed that of the two control groups, considered separately and together.

Duration of 2nd Intermission.

Expressed in Terms of Percentage of Total.

Percentage of Readmission within Six Months of Discharge
"Recovered" or "Improved."

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	6.4	1.3	7.7	MC1 %	4.3	6.3	10.6
FC2 %	12.9	12.9	25.8	MC2 %	3.1	25.0	28.1
FT %	6.6	8.7	15.3	MT %	4.8	14.4	19.2

FT and MT show a lower percentage rate of relapse as compared to FC2 and MC2, but they are much higher than FC1 and MC1. The importance of having two control groups is self-evident.

Percentage of Readmission within One Year of Discharge
"Recovered" or "Improved."

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	6.4	9.0	15.4	MC1 %	4.3	14.8	19.1
FC2 %	17.2	15.8	33.0	MC2 %	3.1	25.0	28.1
FT %	13.1	10.9	24.0	MT %	9.6	19.2	28.8

FC2, MC2, FT and MT show a higher rate of relapse than for the same period after the first hospitalization.

Percentage of Readmission within Two to Five Years of Discharge
"Recovered" or "Improved."

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	24.5	14.2	38.7	MC1 %	23.4	21.1	44.5
FC2 %	20.0	21.4	41.4	MC2 %	6.2	25.0	31.2
FT %	19.6	15.2	34.8	MT %	23.8	19.0	42.8

All six groups show a higher percentage of relapse than for the same period during the first intermission. FC1 and MC1 begin to show a rise in the percentage of relapse as compared to FC2, MC2, FT and MT.

Percentage of Readmission within Six to Ten Years of Discharge
"Recovered" or "Improved."

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	37.4	19.3	56.7	MC1 %	33.9	27.6	61.5
FC2 %	21.4	21.4	42.8	MC2 %	6.2	28.2	34.4
FT %	—	—	—	MT %	—	—	—

All groups show a greater percentage of relapse than for the same period after first intermission.

*Percentage of Readmission within Eleven to Thirty-two Years of Discharge
"Recovered" or "Improved."*

	Rec.	Imp.	Total.		Rec.	Imp.	Total.
FC1 %	42.3	20.5	62.8	MC1 %	36.2	27.6	63.8
FC2 %	—	—	—	MC2 %	—	—	—
FT %	—	—	—	MT %	—	—	—

The Longest Period of Intermission has been as follows :

	Rec. (years).	Imp. (years).		Rec. (years).	Imp. (years).
FC1 . .	18.09	32.7	MC1 . .	12.9	8.4
FC2 . .	6.00	3.7	MC2 . .	3.9	5.2
FT . .	4.80	2.9	MT . .	2.3	0.8

The total percentage of relapse has been clearly demonstrated to increase with the length of time the patient can be traced after his last discharge.

COMMENTARY.

The main conclusions have already been enunciated, but certain additional findings relating to particular aspects of depressive illness which came to notice as the investigation proceeded appeared to warrant brief discussion.

Prognosis in Depressive States.

It is generally conceded that of all conditions necessitating admission to mental hospital, depressive states carry the best prognosis. This general impression is amply confirmed by the results of this present investigation. Of the 923 patients whose individual histories were studied, 61 *per cent.* had only one admission to hospital for a depressive illness. In the 1,611 hospitalizations reviewed, 80-90 per cent. of the individual patients were discharged either "Recovered" or "Improved." An unexpected finding was the relatively large number of patients with an illness of short duration, necessitating only six weeks' stay in hospital. All these findings emphasize the high expectation of recovery in depressive states, and this in turn underlines the necessity for the application of stringent criteria in the evaluation of any form of therapy which claims to accelerate this process of natural recovery.

The Long-standing Depressive Illness.

A small number of patients do not recover from a depressive illness. These patients linger on in hospital, some with their initial presenting symptoms unchanged, others evolving a different and variable symptomatology. The writer originally hoped that convulsion therapy might be proved to reduce the number of such "chronic" patients, but no evidence was found to substantiate this hope. Some authorities have stressed the importance of early administration of E.C.T. as a preventive measure against "chronicity," but again, the evidence in this survey does not support this belief. However, the clinical impression that such cases form but a small number of the total patients admitted with a depressive illness is corroborated in this survey. It may seem remarkable that the lowest figure of all—approximately 10 per cent. "Not Improved"—occurs in the first control group, but it has to be

remembered that this group is composed of patients admitted during an earlier period, and a certain number of the "Not Improved" have died during their residence in hospital. If the two control groups, i.e., untreated cases belonging to both the earlier and later periods, are added together, and then compared with the group of treated cases, the percentage of "Not Improved" in both shows a remarkable similarity. Claims for the efficacy of E.C.T. in preventing "chronic" depression might be made on the grounds that the percentage of patients "Not Improved" is distinctly lower in the treated group as compared to second control group (patients *not* treated by E.C.T., in the same chronological period). It has already been demonstrated that the factor of selection has operated in the case of patients submitted to E.C.T., and that while it may well be true that some cases of depressive illness in the second control group appeared too mild to warrant the use of E.C.T., it is also impossible to ignore the evidence that many more patients were eliminated from treatment because of age, or intercurrent illness. It must be emphasized, therefore, that the only fair comparison is that between the treated group and *combined* control groups, and, as already stated, the percentage "Not Improved" (i.e., of chronic depressive illness) is almost identical in both.

Suicide.

The general statement can be made that in the control groups suicide occurred most frequently while the patient was undergoing treatment, whereas, in the treated group, suicide took place following discharge. The suicide figures in relation to *first* hospitalization are tabulated hereunder:

	Total No.	Suicide occurring during treatment.	Suicide occurring after discharge.	Weeks.
FC1	4	3	1	266
FC2	5	2	3	2, 41, ?
FT	5	—	5	1, 1, 4, 16, 28
MC1	3	3	—	—
MC2	2	1	1	?
MT	2	—	2	Few weeks ?

Accuracy can only be claimed for the figures in the second column, i.e. suicide occurring while the patient was still under treatment. Unless follow-up is stringent, many cases of suicide in patients discharged from hospital must go unrecorded. The above figures seem to indicate that the greatest incidence of suicide in treated cases occurs within twelve months of discharge from hospital, which is also the period with the highest percentage of relapse.

The Clinical Evaluation of E.C.T.

Whatever the results of statistical comparison, clinical observation supports the therapeutic value of E.C.T. in the depressive states. The majority of patients submitted to this form of therapy shows some degree of clinical improvement. They have a subjective feeling of well-being, their sleep and appetite improves. In some this improvement is slow and steady, in others

it is punctuated by phases of relapse. A minority appear resistant to treatment. Yet in some of these the resistance is not permanent, as shown by a favourable response if treatment is repeated after an interval of time. It would appear from this that there is an optimum time in the illness for the application of this form of therapy, but, if so, no criteria for its calculation have so far been laid down. No categorical statement can be made from this investigation, but scrutiny of the figures seems to indicate that the first course of E.C.T. should not be given until six to eight weeks after admission, and that if this course is not effective, an interval of three months should be allowed to elapse before the giving of a second course. Some patients are made worse by E.C.T. The response to E.C.T. was found to depend on the symptomatology exhibited in the individual case, and it is hoped to present the evidence for this in a later paper.

Nevertheless, despite the frequent improvement in the mental state of the patient observed after E.C.T., the results of the present investigation show that the duration of the illness is not thereby decreased. The inevitable conclusion is that convulsion therapy is palliative rather than curative in its action. The means whereby convulsion therapy exerts its action is as yet unknown; despite the years which have elapsed since its introduction, it remains an empirical form of treatment. Scrutiny of its effects in the 318 hospitalizations under review leads to the conclusion that E.C.T. produces some physical change which stimulates the mechanisms which, without such intervention, would still bring about spontaneous recovery.

SUMMARY.

In this survey 923 patients suffering from a depressive state were studied throughout their various hospitalizations, which amounted to 1,611: 608 were female patients with 1,054 hospitalizations, and 315 were male patients with 557 hospitalizations.

For purposes of comparison three groups were selected as follows:

1. First control group—hospitalizations of the period 1930–39, when E.C.T. was not available as a method of therapy.
2. Second control group—hospitalizations of the period 1940–48, when E.C.T., although available, was not utilized for treatment.
3. Treated group—hospitalizations of the period 1940–48, when E.C.T. was the treatment of choice.

The two "Control" groups and the single "Treated" group were compared in relation to (a) percentage rate of recovery, (b) duration of hospitalization, and (c) frequency of readmission.

(a) The percentage rates of recovery in the various groups were (see Table at top of p. 1091).

Thus, the percentage rate of recovery does not vary greatly whether patients are treated conservatively or with electric convulsion therapy. Such slight differences as may exist are statistically insignificant.

(b) *Duration of Hospitalization.*

It was found that the use of E.C.T. did not shorten the duration of hospitalization to any significant degree.

	Recovered.	Improved.	Not improved.
	(%).	(%).	(%).
First female control group . (406 hospitalizations)	54·3	35·6	10·1
Second female control group (328 hospitalizations).	43·6	33·5	22·9
Females treated with E.C.T. (217 hospitalizations).	57·1	27·2	15·7
First male control group . (233 hospitalizations).	46·8	43·3	9·9
Second male control group (149 hospitalizations).	36·9	44·3	18·8
Males treated with E.C.T. . (96 hospitalizations).	51·0	37·5	11·5

(c) *Frequency of Readmission.*

(1) In the period within 6-12 months of discharge—

(i) The majority of cases discharged "Improved" in both control and treated groups had a higher percentage of relapse than those discharged "Recovered."

(ii) Cases discharged "Recovered" in the treated group had a higher incidence of relapse than similar cases in the control groups.

(2) When more than 12 months had elapsed since discharge from hospital the incidence of recurrence increased with the length of the chronological period through which the patient was followed up.

(3) The greater the number of previous hospitalizations, the higher the percentage of relapse.

Conclusion.—Although the statistical evidence in this survey does *not* prove that E.C.T. increases recovery rate, decreases duration and prevents recurrence in depressive states, clinical observation testifying to its value cannot be disregarded. Convulsion therapy frequently ameliorates symptoms and renders the illness more bearable, and it would therefore appear to act by stimulating the mechanisms which bring about spontaneous recovery. Increased knowledge regarding its mode of action may therefore lead to increased understanding of depression as a clinical entity. The absence of such information stresses the continued necessity of detailed study of the individual patient and his symptoms in their total setting.

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I wish also to record my gratitude to Professor A.C. Aitken, of the Chair of Mathematics, Edinburgh University, for scrutinizing the final statistical calculations; to the Commissioners of the Board of Control, Scotland, for allowing me access to their records; to Dr. Elizabeth Robertson for correcting the manuscript; and to the hospital secretaries, Mrs. Lemon and Miss Morris, for their cheerful willingness to transcribe the mass of statistical data.

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Part II.—Reviews.

Epilepsy and Convulsive Disorders in Children. By EDWARD M. BRIDGE, M.D. New York: McGraw-Hill Book Co., Inc., 1949. Pp. xiv + 670. Price 51s.

This is an account of the work carried out with children at the Epilepsy Clinic at the Johns Hopkins Hospital.

The book is thoroughly up-to-date, and gives a detailed and helpful account of epilepsy in children—always a difficult illness to deal with. The dangers of tridione in treatment are wisely emphasized; it is, however, a drug to be persevered with, as it is almost specific for *petit mal*, the attacks disappear, and the E.E.G. returns to normal in many cases.

A curious feature for a medical text-book is the provision, before each chapter, of a "pictorial" table of contents; possibly they may serve a useful purpose, but they resemble a child's schoolbook rather too much for our liking. In another edition they might to advantage be omitted.

G. W. T. H. FLEMING.

The Adolescent and the Family. By STELLA CHURCHILL. London: Cresset Press, 1949. Pp. 165. Price 7s. 6d.

This is an instruction book for parents, which covers management of the health, education, morals, and upbringing of adolescents. The authoress's views on education are individual and would not necessarily command general support. As would be expected in a book by a member of a distinguished medical family, most of the advice on health is sound, but it is a little surprising to find expression of the old-fashioned idea, disproved by Hawksley ten years ago, that growing-pains are early signs of rheumatism. It must also be doubted if impetigo is caught from digging in dirty sand. The treatment here described for *pediculosis capitis* is out of date.

The chapters on sex knowledge and falling in love are the best the reviewer has ever read, being frank, accurate, and at the same time tender, sensitive, restrained, and considerate.

It is a pity that the writing is careless and often ungrammatical, for there is room for such a book as this to help the earnest parent to be sensible instead of sententious, though it must be doubted whether advice, however excellent, has much effect on any of us, since our actions are mainly governed by unconscious impulses and not by reason, a fact which the authoress fully realizes.

E. S. STERN.

Mental Hygiene in Public Health. By PAUL V. LEMKAU. New York, Toronto, and London: McGraw-Hill, 1949. Pp. xiv + 396. Price 38s. 6d.

In the U.S.A. the public health authority is responsible for psychiatry, and so it is particularly important for the medical officers of health and their staff to have a general knowledge of the subject. This book is an able and ambitious attempt, probably the forerunner of others, to supply that knowledge. It is divided into two parts: "The Place of Mental Hygiene in Public Health," which describes how educational programmes in some states have taught the general practitioner to recognize the emotional causes of disease early, and which also contains some notable suggestions, and "The Development of the Individual."

This latter part occupies two-thirds of the book; it is sound and well documented, quoting, amongst other things, Kinsey's figures on male and Davis's on female sexuality. It is full of good psychiatric practice. Infant welfare staffs were taught to deal with emotional problems in mothers, many of whom regard any abnormality in their children as evidence of their own sin. Advice was given on the baby's need for physical affection, the advantage of bedding him in his mother's room, and the avoidance of rigid feeding schedules. It is pointed out that the child feels more secure with a firm and determined parent, that paediatricians ask for detailed information about the stools, but nothing about the more important temper tantrums, and that the school doctor and nurse are adept at discovering physical illness, but inept as regards the recognition of emotional disorder. The various ages of man are described, the chapters on the adolescent and young adult periods being superlative. The high correlation between the marriage patterns of parents and children is noted and explained.

There are two appendices: a review of psychopathological states, which is rather old fashioned in parts, and so not up to the high standard of the rest of the book, and a list of instructional films available.

Mistakes are few. Helene Deutsch and Grantly Dick Read are misspelt. It is usual in scientific treatises to give deliria as the plural of delirium. But the book is clearly written, beautifully arranged and printed, and generally in advance of current practice. If its teaching could be followed by the medical profession in general, and those practising State medicine in particular, the happiness of the people would be greatly increased.

E. S. STERN.

Modern Discoveries in Medical Psychology. By CLIFFORD ALLEN.
Second edition. London: Macmillan, 1949. Pp. xii + 236. Price 12s. 6d.

In this edition a chapter on physical treatments and an alphabetical index have been added, there are no other major changes, yet the number of pages is reduced by the use of smaller print.

An interesting historical account of the development of psychopathology is given, and modern views are clearly and attractively explained. Perhaps too much space is given to Morton Prince's "Dissociation of a Personality," for this is not of fundamental importance and is, nowadays, rather tedious reading.

There are some minor errors. "Vicariate" is either an exceedingly rare word or a neologism (p. 192). "Protozoa" is plural, and tertian ague—in spite of its name—gives recurrent pyrexia every two days (p. 201). But these are details at which to cavil. The book remains the best survey of the various schools that we know for the beginner in psychiatry, and it is heartily recommended.

E. S. STERN.

Contributions to Psychoanalysis, 1921-1945. By MELANIE KLEIN.
London: Hogarth Press, 1948. Pp. 416. Price 21s.

The publication of most of Mrs. Klein's papers is an event, for she occupies a unique position in psychoanalysis. To an extent she has split the movement by her heresies but, remaining within it, she has not been met by the full odium psychoanalyticum. Her work with children is characterized by full interpretation to the patient, which has been criticized by Anna Freud, because it is possible that such interpretations may come from the therapist's rather than the child's unconscious mind. On the other hand, it may be held that the authoress is right, as against Miss Freud, in insisting that the analyst must refrain from teaching. Perhaps a combination of these two procedures is inclined to produce too strong a super-ego.

This collection falls into two principal parts : the psychoanalysis of children by play technique, and the concept of manic-depressive disorder which has followed from this. Besides papers on infant analysis, there is an excellent one on the early stages of the Oedipus conflict, with an explanation of female character formation, and important ones on child development, the role of the school in this, on intellectual inhibition, including a contribution to the understanding of backwardness, and on infantile anxiety. These early papers still read exceedingly well, except for two on criminality, which are rather superficial, and now transcended by the researches of the late Kate Friedlander. The classical papers on mourning and the psychogenesis of manic-depressive states are, of course, included, with their development of the concept of the depressive position.

Naturally there are weaknesses. Mrs. Klein attributes to unconscious factors those cases of early childish scholastic success followed by comparative failure. Surely a more likely explanation is that early school success depends more on memory, and later success on "g." Admittedly it is conceivable that such imbalance is itself due to unconscious factors. She is puzzled by the child's apparently meaningless repetition of his questions. Is not this simply due to his wish to reassure himself of the consistency of the adults, and so of the constancy of the external world?

There are many excellencies. Every adult should mark her statement that "There is *no* child without difficulties, fears and feelings of guilt, and even when these seem to be of small importance, they cause much greater suffering than would appear, and are, in addition, the early indication of much greater disturbances in later life." She points out that children's accidents are often due to the desire for punishment for Oedipus guilt. She postulates the development of the super-ego as soon as the child makes his earliest introjection of his objects, and that of the oedipus in early infancy and before the age of three to five years given by Professor Freud. She explains the frequency of paranoid symptoms in melancholia by the difference between the two psychoses merely lying between the anxiety of introjecting dangerous substances in paranoia and that of destroying internal good objects by biting or chewing, or endangering them by introducing bad substances from within in melancholia. She explains the intractability and ineducability of schizoid and paranoid persons by their fear of reality and the external world, which they must deny in order to remain in their phantasies.

The authoress's forceful personality is well conveyed to the reader, and her ideas are so thoughtful and stimulating that no thinking psychiatrist can afford to ignore them. The papers are well illustrated by case-histories, but, as is usual in studying psychoanalytical works, the reader should, while perusing it, himself carry out analyses of patients by means of the free association technique.

E. S. STERN.

Psychoanalysis. By EDWARD GLOVER. Second edition. London : Staples Press, 1949. Pp. 367. Price 15s.

This systematic account of psychoanalysis for doctors and psychologists is greatly expanded, and has two and a half times as many pages as the first edition of 1939. The chapter headings are the same, with the addition of one on psychosomatic and allied disorders, and of an appendix and a glossary. The resulting volume is not comprehensive, for the subject is too large for that, and it is less succinct or readable.

Dr. Glover is an exponent of the purest Freudian doctrine, and has little sympathy with the new school. Melanie Klein is not mentioned by name, and her *Psychoanalysis of Children* is deleted from the list of books recommended!

The weakest parts of Dr. Glover's book are those dealing with psychotics,

of whom the author seems to lack experience. It is surprising to find the obsolescent diagnosis of neurasthenia used for a syndrome that seems identical with the modern concept of melancholia. Kraepelin's statement that convulsions occur in catatonia is likewise discredited. Epileptics are not lazy, but to the contrary, and the differential diagnosis of this condition does not usually present difficulty to a competent psychiatrist. The author seems to fall into the common error of mistaking examples of perseveration of thought for obsessions in melancholia. Cases of paranoia are not hallucinated; indeed, this is the principal diagnostic point. In the section on prognosis the author has omitted consideration of the anxiety neurosis. The assertion that all psychotherapeutic methods except psychoanalysis depend on suggestion is without foundation: indeed, some wise psychotherapists do not even interpret material themselves, but merely assist the patient to do so.

If this book has faults, it also has solid virtues. The analogy between repression and sleep is brilliantly illuminating, and the explanation of projection is well done. Although the statement that in melancholics there is usually a history of early physical illness affecting the mental functions is, in the reviewer's experience, an exaggeration, he can confirm the observation that such patients have usually felt unloved in childhood. The chapters on drug addiction, psychosexual disorders and social difficulties are well done, especially the first, and the section on psychopathic states in the last. One wishes for more on those subjects which the distinguished author has made so peculiarly his own. There is a good section on psychological examination. The glossary is helpful, but needs a few corrections.

Though the book is dogmatic, it is too full for the general practitioner, and too advanced for the student, but the intelligent psychiatrist will gain much profit from it.

E. S. STERN.

Perspectives in Neuropsychiatry. Edited by DEREK RICHTER. London: H. K. Lewis & Co., Ltd., 1950. Price 15s.

This is a series of essays presented to Professor Golla in commemoration of his seventieth birthday.

Professor le Gros Clark's chapter on anatomy deals very largely with the hypothalamus, and Professor Meyer's with the frontal lobes and the effects of leucotomy thereon. The two chapters should be read as one, as there is no doubt that there is a close interconnection between the frontal cortex and the hypothalamus, and this is interfered with to a varying degree by leucotomy.

The next four chapters, on Neural Nets and the Integration of Behaviour, by Dr. Brazier; E.E.G. as an Instrument of Research in Psychiatry, by Dr. Hill; Features in the Electrophysiology of Mental Mechanisms, by Dr. Grey Walter; and the Cerebral Mechanism of Intelligent Action, by Dr. W. Ross Ashby, all deal with the electrophysiology of the brain, questions of feed-back, etc., and need to be considered as a whole.

The next two chapters, dealing with the Biochemistry of Cerebral Function, by Dr. Richter, and on the Endocrinology and Pathophysiology of Mental Disturbances, by Drs. Hemphill and Reiss, are related to each other.

Then follow chapters on the Concept of the Schema in Neurology and Psychiatry, by Dr. Russell Brain; the Relationship of Mind and Matter to Personality, by Dr. Hutton; Perspectives in Psychiatric Genetics, by Dr. Eliot Slater; Forensic Psychiatry, by Sir Norwood East; Aims and Methods of Treatment, by Dr. William Sargant; and Mental Hospital Problems, by Dr. Gjessing of Oslo.

It would be invidious to select any one chapter as outstanding—the whole book is outstanding as a contribution to modern psychiatry and, to a very large extent, as an indication of the British attitude to the many problems which confront the psychiatrist, both inside and outside of hospital.

It serves to emphasize in no uncertain manner—and this cannot be too strongly pressed—the extreme importance of a really wide knowledge of not only neurophysiology, but physiology as a whole. Physiology is the basis on which the whole structure of modern psychiatry is built.

Dr. Richter is to be congratulated on presenting a fine tribute to one who has striven for many years to help the younger generation in their work, and who has done so much for British Psychiatry. Professor Golla must feel proud of his past pupils and associates.

G. W. T. H. FLEMING.

Annual Review of Psychology. Volume One. Edited by C. P. STONE. Stanford, California: Annual Reviews, Inc., 1950. Price \$6.

This is the first annual volume of a series on the same lines as the well-known and quite invaluable *Annual Review of Physiology* and *Annual Review of Biochemistry*.

The editorial board are careful to point out that the ground covered is, to a very large extent, confined to work published during the previous year, and that the chapters are not merely a loosely integrated series of abstracts, but present an interpretative and evaluative approach to the literature.

The review is on an annual basis in the case of the most active and general fields, but is on a biennial basis in the case of less important or less active topics.

The present volume covers Growth, Development and Decline, Learning, Vision, Hearing, Somethesis and the Chemical Senses, Individual Differences, Personality, Social Psychology and Group Processes, Industrial Psychology, Animal and Physiological Psychology, Abnormalities of Behavior, Clinical Methods, Educational Psychology, Counseling Methods, Statistical Theory and Research Design, and Problem Solving and Symbolic Processes.

The various chapters are well done and well documented, and the book forms a worthy companion in the Annual Review series.

G. W. T. H. FLEMING.

Aviation Medicine. By K. G. BERGIN, M.D. Bristol: John Wright & Sons, Ltd., 1949. Pp. xvi + 448. Illus. 120. Price 35s.

This book is a compilation from a large variety of sources, including the author's wide experience as a qualified pilot in civil and military flying and medical officer in charge of operational air-crew personnel in the R.A.F.

The book is divided into three main sections, dealing with physiological, medical and psychological considerations.

The author gives a great deal of detail on the atmosphere and respiration, the need for 100 per cent. oxygen at high altitudes (and even pressurized oxygen), the effects of "g" on the aviator, of alcohol and smoking, of temperature, ventilation, humidity, noxious fumes, noise and vibration.

Under the medical section we find the effects given of anoxia, explosive decompression, oxygen poisoning, decompression sickness, air-sickness, fatigue, frost-bite, burns, etc.

Under the psychological section are given air-crew neurosis, flying stress, etc.

This book is full of most interesting details which the ordinary medical practitioner is quite ignorant of, and will repay careful reading by every medical man.

G. W. T. H. FLEMING.

A Text-book of Psychiatry. By Sir DAVID HENDERSON and the late R. D. GILLESPIE. Seventh edition. London: Geoffrey Cumberlege at the Oxford University Press, 1950. Pp. xii + 740. Price 32s. 6d.

"Henderson and Gillespie" needs no introduction to our readers; it is almost a household word, and a book of which British Psychiatry may well be proud.

In this seventh edition attention is drawn to man in relation to his environment, and, as the book in all its editions is dedicated to Adolf Meyer, one naturally expects to find the psychobiological attitude to mental illness emphasized.

The chapter on psychopathic states has been largely rewritten, and this is undoubtedly a great improvement. One wonders whether the optimistic view is really justified. So very little has been shown in the way of results with psychopathic states: they are a very difficult problem, and no one has yet shed much light on the condition. Results of treatment are practically *nil*, especially with some of the milder conditions which are the despair of doctor and of relatives alike.

It is refreshing to see transorbital leucotomy receive mention. The disturbance of personality is much less than with the ordinary blind operations. The more extensive operations have yet to be fairly assessed. The incidence of seizures in transorbital leucotomy is almost *nil*.

We do not agree with the statement that thoroughly satisfactory ways of dealing with the ordinary chronic alcoholic are non-existent. Antabuse treatment has proved quite successful when persevered with over a considerable space of time, and the Danish school have had good results in a large number of cases. It has to be combined with psychotherapy, and needs patience.

We think the *Journal of Mental Science Special Number*, 1944, on p. 724, should be mentioned under its proper title of *Recent Progress in Psychiatry*. A number of works mentioned in the bibliography are rather out of date, and a number that have been published during the last five years might, with advantage, have been included. However, these are small defects in an excellent book.

G. W. T. H. FLEMING.

Compulsion and Doubt. By WILHELM STEKEL, translated by EMIL A. GUTHEIL. Volume I. New York: Liveright, 1949. Pp. x + 323. Price, two volumes, \$7.50.

In giving his own variations from the psychoanalytic theory, the author characteristically quotes plenty of cases. These are lit by his flashing and brilliant insight, yet their full depth and detail are not seen in that full clarity given only by the illumination of deep and prolonged study. He suggests that religious ritual on the one hand, and social conventions, morals, and etiquette on the other, are essentially a compulsion neurosis; but are there not extensive hysterical and even psychotic elements in the former, and are not the latter largely matters of mutual convenience, sympathy and consideration? He recognizes that neuroses are entirely the result of a psychic conflict, and not attributable to a vague heredity. Obsessions are worse in the rich or unoccupied. Sometimes compulsions may satisfy the patient's hunger for affects, and so provide interest in a monotonous life. In all compulsions the patient fights a painful memory, and the symbol conceals an idea. The author doubts the existence of the unconscious, but surely there is sufficient evidence for it in the mechanisms of errors, dreams, hypnosis, and mental mechanisms and disorders, as well as from free associations.

This is a stimulating book, even if the author's attitude is rather complacent, and we look forward to the second volume. The translation is adequate, but not impeccable.

E. S. STERN.

Masochism in Modern Man. By THEODOR REIK, translated by MARGARET H. BEIGEL and GERTRUD M. KURTH. Second impression. New York: Farrar, Straus & Co., 1949. Pp. vi + 439. Price \$6.00.

The title of this book is misleading, for it is really a monograph expounding the author's particular psychoanalytic theory of masochism. He points out that the masochistic act is preceded by a pleasurable anxiety tension. The

masochist wants to be seen and loved because of his pain. In fact, he makes a point of telling us that he suffers in silence. His sins must be forgiven, since he has been punished for them. Yet, by passively submitting to all punishments, he demonstrates their futility, and thus also his own power. He achieves victory through defeat.

The author, curiously, considers women to be less masochistic than men. He seems contemptuous of the views of other psychoanalysts. On the other hand, he quotes rather few clinical cases himself on which to base a new theory, and some of his historical illustrations seem rather forced. The translation is indifferent, and the book diffuse and tedious, but experts in the subject may find the author's ideas stimulating, if not convincing. E. S. STERN.

What is Psychoanalysis ? By ERNEST JONES. London : Allen & Unwin, 1949. Pp. 126. Price 7s. 6d.

This is an authentic yet simple explanation of psychoanalysis, with an indication of some of its applications, by its foremost living exponent. The writing is characterized by the author's usual clarity and moderation. There is a good bibliography, and the type is large and clear. The exposition is suitable for the non-medical beginner. E. S. STERN.

Psychoanalysis To-day. Edited by SÁNDOR LORAND. London : George Allen & Unwin, 1948. Pp. xvi + 404. Price 25s.

This symposium, dedicated to Freud's memory, is by leaders of psychoanalytic thought. It begins with biographical notes on the contributors, followed by an appreciation of the Freudian approach to general and psychosomatic medicine respectively by Jelliffe, Ferenczi, Dunbar, and English. The psychoanalysis of children is covered in chapters by Kris, Klein, Oberndorf, Ames, and Broadwin. Marion Kenworthy contributes a refreshing chapter on social work, and Jule Eisenbud, in that on mental hygiene, states, in reference to early views, "The 'maladaptability' ascribed to the individual was still regarded in the nature of a defect not far removed from the notion of 'constitutional inadequacy' which was at the time, and still tends to be, a thinly disguised version of the concept of original sin." Would that we had all progressed beyond this stage of thought !

Alexander writes on ego psychology, and Meyer is particularly good on dreams, a subject that particularly lends itself to brilliant synopsis. In discussing secondary elaboration he omits to mention that this may be an unconscious function of the waking mind. Character formation is covered by Glover and Lorand, and the psychoneuroses by Brill, Kardiner, and Lewin. Twenty years ago any psychoanalytic approach to the psychoses was novel, suspect, and stumbling. In this volume we accept the chapters on the subject by Schilder, Zilboorg, Hinsie, and Ophuijsen as a matter of course, the last named's views on organic psychoses being brilliant and original.

As is usual in psychoanalytic works, the chapters on war neurosis, technique and therapy are rather weak. They are written by Simmel, Lorand, and Bunker respectively. Lastly, we have Jones on religion, Hartmann on sociology, Schilder on crime, Kris on art, Rôheim on anthropology, and Wittels—a detail of whose terminology I have already criticized in this Journal (94, 330)—on literature.

A high standard is maintained throughout, and there is remarkably little overlapping. It is an excellent summary of psychoanalysis.

E. S. STERN.

The Mask of Sanity. By H. CLECKLEY, M.D. Second edition. London : Henry Kimpton, 1950. Pp. 569. Price 45s.

This is a very interesting and useful work on psychopathic personality. The author has studied and written on psychopaths for many years, and this

is the result of his experience. He shows his understanding of the psychopath by quoting the familiar attitude of some women. "She longs to take this defenceless creature, hold him to her breast, guard him, shape him and let him grow up under her protection. Her feminine intuition, which so accurately divines the presence of the spiritual baby, fails, alas, to understand that it is a baby who will never grow up."

Unfortunately, society prefers to ignore the existence of the psychopath to a large extent and, as the writer says, "the majority are totally ignored by society and left to their devices—devices which we hope have been illustrated." They are, indeed, and most psychiatrists who have to cope with mental illness outside the mental hospitals are only too familiar with the hopeless task of coping with these people, for whom the present legal procedures make no provision.

The author considers that the psychopath should be restricted by some legal instrumentality such as an indeterminate sentence, and competent psychiatric judgment should be considered in deciding when he is to be returned to the community, and afterwards in the application of measures to safeguard and supervise him.

The case-histories given may sound rather grim to English ears, but they can be matched fairly easily in this country, and there is a much bigger problem, that of dealing with the mild or borderline psychopath. It is probably expecting too much to hope for a solution of this problem in our day, as so many of these people have a very charming social facade behind which they "get away with" a lot of evil.

G. W. T. H. FLEMING.

The Diagnosis of Hysteria. By D. W. ABSE, M.D., B.Sc., D.P.M.
Bristol: John Wright & Sons, Ltd., 1950. Pp. 112. Price 8s. 6d.

Dr. Abse records that, when in the Royal Army Medical Corps in India, during the recent war, he found that his colleagues diagnosed hysteria only by the exclusion of organic disease. He tried to persuade them that a positive psychiatric diagnosis was possible.

The book therefore explains that a mental conflict exists in hysteria, and that a psychiatric history is based on "a chronological correlation of the onset of symptoms, of their perpetuation, exacerbation, and disappearance, with the *life-situation* of the patient."

A psychoanalytic account of the psychopathology of hysteria is given to complete the making of the diagnosis. "The positive diagnosis of hysteria depends upon an understanding of the aetiology and psychopathology, as well as the symptomatology of the disease."

C. E. H. TURNER.

The Inner Experience of a Psychoanalyst. By THEODOR REIK, M.D.
London: Allen & Unwin, 1949. Pp. 514. Price 21s.

A distinguished physician used to say to his students, after he had given the pros and cons of a differential diagnosis, "but I feel in my bones it is a case of —" naming the diagnosis of his choice. Dr. Reik discusses such insight when it occurs in the psychoanalytic situation.

He holds that the good psychoanalyst, like Freud, is born and not just made. His self-discovery continues with each patient he analyses, for, in searching after the truth of the unconscious mind of the patient, the analyst must search his own subjective response to what the patient is saying. "Ask your heart what it doth know"—study alone will not result in psychoanalytic understanding: the real source of our best insights is indicated in Shakespeare's lines." Dr. Reik maintains that this inner truthfulness demands moral courage to accept the shock and suffering of self-knowledge.

The psychoanalyst, according to Dr. Reik, waits in silence, of which he is not afraid, until his conjecture of the interpretation jumps to his mind. It

is not then communicated to the patient until he, too, is near to the solution, which then "seems to hang suspended in the air."

Whether one agrees with the interpretations given of the many cases described is irrelevant to the main theme of the book; irrelevant, too, are the long digressions and frequent accounts of differences of opinion with fellow psychoanalysts; for Dr. Reik has written a book which is worth while. It is based on 37 years of psychoanalytic experience, but is remarkably free from jargon. The book will be stimulating to the young psychoanalyst and refreshing to the experienced psychotherapist; it will be of interest also to the physician or lay person, who wonders about the insight which one person, such as a poet, writer or psychoanalyst, can have into the inner life of another.

C. E. H. TURNER.

Psychology and Mental Health. By J. A. HADFIELD, M.A., M.B., Ch.B.
George Allen & Unwin, 1950.

In this very substantial tome will be found a mass of interesting material and shrewd observations such as we might expect from one as experienced and thoughtful as the author. Nevertheless, the book is in some respects disappointing, both as to its subject-matter and its presentation.

The first third of the book is devoted to general considerations and to the psychopathological background of mental abnormality, and is therefore in keeping with the title; the other two-thirds, however, are mainly clinical, and are concerned with psychosomatic disorders and psychoneuroses. The greater part of the work cannot be regarded as any more than yet another description and interpretation of psychoneurotic illness. The whole creates an impression of diffuseness, it is long drawn out, and clarity is not assisted by the extravagance with which nearly every page displays phrases emphasized by means of italics.

Psychoneurosis and neurosis are throughout used as interchangeable terms, and the classification of these disorders is into three groups—hysteria, obsessions and sex perversions. The author professes to be specially attracted to Jung, but nowhere is there any adequate account of Jung's psychology; indeed, his name only appears in brief references on five widely separated pages. Freudian conceptions, on the other hand, figure very prominently, but the account and use made of them are most unorthodox. For instance, the super-ego is partly identified with the conscious conscience, while (like several other neo-Freudians) the author stresses the loss or feared loss of mother-love in the non-sexual sense of protective maternal affection. Owing to the diffuseness mentioned above, it is difficult to glean any systematic view of the phases and facets of the child's psychological development.

The section on treatment is rather unbalanced in that the only non-psychotherapeutic procedure that receives more than a passing mention is occupational therapy, this being described in a short paragraph sandwiched between the section on persuasion and the one on suggestion; therapeutic work only is mentioned, and there is no reference to the many other (social, recreational, educational) forms of general rehabilitation.

A striking feature of the book is the refusal to discuss the psychoses and the conception of their nature on which this decision is based. On p. 18 it is explained that only the psychoneuroses will be dealt with because they are more accessible to prevention and cure, "whereas the psychoses . . . being largely hereditary and constitutional are far less accessible to prevention and much less amenable to cure." Again, on p. 143, the author avers, "it is better to regard as psychotic those mental disorders that are the result of organic and mainly constitutional causes." This seems not only a counsel of despair, but it fails to do justice to the multiple causation of many mental troubles, to the quantitative assessment of co-existing factors, or to the danger

and inadequacy of attempting to classify mental disorders on the principle of selecting in each case one particular cause to the exclusion of others.

J. E. NICOLE.

Fundamentals of Psychoanalysis. By FRANZ ALEXANDER, M.D. George Allen & Unwin, 1949.

This is the first of two volumes intended to take the place of a third edition of the author's earlier work, *The Medical Value of Psychoanalysis*.

The book is clear, concise, and gives a good account of the basic principles of dynamic psychology, largely on a Freudian basis. The author elaborates his view that eroticism is not so much a specific function as the discharge of any surplus excitation for its own sake, and in ways not subservient to the essential needs of the total organism.

He also denies any true "death instinct," and views the functions of the organism as based on two vectors, the one integrative and the other disintegrative. The effects of the latter may be death, in so far as the parts cannot live without the whole, but death is not the aim.

The book is well indexed, with an extensive bibliography, and one awaits its companion with pleasurable anticipation.

J. E. NICOLE.

Festschrift Zum 70. Geburtstag Von Professor Dr. Otto Pötzl, edited Professor Dr. H. J. URBAN, Universitaetsverlag Wagner, Innsbruck, 1949.

This is an impressive volume, containing 37 essays on the most various psychiatric subjects by Professor Pötzl's former co-workers, now living as far apart as New York, Capetown, Melbourne and Pekin. The work testifies not only to the affection in which he is held by them—this volume has been produced in honour of his 70th birthday—but also to his stimulating influence and comprehensive vision, which allowed him to give impetus and inspiration to people interested in all branches of psychiatry and neurology.

The editor emphasizes Pötzl's pioneering spirit in being the first to introduce in a German-speaking university lectures on psychoanalysis and in starting a psychotherapeutic out-patient department. Equally great was his courage in other approaches to psychiatric problems, as exemplified by the opportunity he provided for Sakel, who introduced the hypoglycaemic treatment of schizophrenia.

The essays of this volume differ greatly in general importance and in subject-matter, and each reader will single out other essays for their quality and for their personal interest.

The reviewer was personally most interested in Caruso's article on "Depth Psychology and the Christian World View." He conceives neurosis as an "existential" lie which, however, implies striving for existential truth. Original sin and grace cannot be disregarded. In depth psychology the neglect of either or both the biological and theological, and an attempt at a neutral, rationalistic standpoint, even if the spiritual in this is acknowledged, will lead to shipwreck. Caruso alleges that this spiritual and moral nature of the problem of neurosis has been ignored by psychoanalysis and its derivatives, in favour of a biological and psychological interpretation. He discusses the "deterministic" and "existential" approaches (the latter as yet practically unknown in this country), and holds that they are far from comprehensive. He wishes to see a universalistic approach, something in the kind of a universal anthropology. The psychotherapist will find this essay and others by the author worth pondering.

Berze, in his "Psychotherapy from Reason to Reason," introduces us to Frankl's logotherapy and existential analysis, and Frankl himself contributes

a short essay on the teaching and learning of psychotherapy, in which he stresses the importance of the therapist's personality.

The book is well produced. Each essay is followed by a summary in German, English and French. One is, however, astonished to see a very great number of linguistic errors in these. Though the scientific importance of this kind of medley of unequal contributions seems doubtful, the volume is certainly apt to bring to our notice some of the lines of psychiatric thought pursued by German-speaking psychiatrists, as 24 of the 37 essays have been written by workers domiciled in Germany and Austria.

D. I. SALFIELD.

Society and the Criminal. By Sir NORWOOD EAST, M.D., F.R.C.P.
London: His Majesty's Stationery Office.

The works of the author are known to every student of forensic psychiatry, and this latest publication consists of a collection of papers issued during the past ten years or so. Most of the contents will already be familiar to many readers, who will nevertheless welcome being now able to have them conveniently in one volume. The subject-matter covers a wide range of medico-legal problems, and the author brings to bear his extensive experience and knowledge of the criminal mind to evaluate the various factors involved in the aetiology of criminal behaviour and to suggest possible remedies. While discussing the various forensic psychiatric problems, he adopts a sound scientific approach, but never loses sight of the important legal and administrative aspects. The paper on "Crime and Punishment," which was read at the Annual Meeting of the R.M.P.A. in July, 1946, in particular should be read by every psychiatrist likely to be called upon to give evidence in court. In several of the essays the author stresses the importance of the non-sane non-insane group of offenders, and he gives a useful practical classification of psychopathic personality. He stresses that it is an error to assume that an abnormal crime is necessarily committed by a mentally abnormal criminal, and warns society that they have a duty to the criminal, however lacking the criminal may be in his duty to them. As on previous occasions, one is impressed by the author's wide reading and numerous references. This is a book for constant reference, which will be welcomed and read with pleasure by all concerned in the handling and treatment of offenders.

F. H. TAYLOR.

Delinquency and Human Nature. By D. H. STOTT, M.A. Carnegie
United Kingdom Trust.

In this book the author details the results of his investigations of a group of young delinquents in an approved school. At the start it is clear that he has approached the problem in the only really satisfactory and practical way, by residing in the school with the boys he was studying. Though the number of cases is small, being only 102, the care with which each boy was examined, and has subsequently been classified and described in the book, leaves one in no doubt that the author's conclusions must be accepted as one of the most valuable contributions so far made to what is recognized as one of our most difficult social problems. The findings corroborate the work of Bowlby,* whose influence is reflected throughout the book and is acknowledged by the author. Stott formulates the thesis that the delinquent breakdown of each boy resulted from finding himself in what was, for him, an intolerable emotional situation, and each case is dealt with *in toto* to show how this took place. He describes how behaviour syndromes are formed in response to emotional cross-currents, and statistical analysis shows the five main motives to be avoidance-excitement, retaliation and resentment against the parents, delinquent-attention, desire for removal from the home, and inferiority compensation. The

* *Forty-four Juvenile Thieves*, by John Bowlby. London, Baillière, Tindall & Cox, 1946.

boys' home and environmental difficulties are fully described, and their influence assessed. They are similar to those found in the higher age-group of Borstal inmates.* The grouping into such categories as anxiety over parental ill-health or quarrels, emotional estrangement as the result of divided parent relationship, or following evacuation, emotional difficulties following loss of parent by death or by broken marriage, etc., has been most carefully compiled. The author stresses that the individual must be told he is responsible for his actions and held to account for them, and however deep a lad's emotional disturbance, it must be pointed out to him that, much as his difficulties and their origin are understood, the public and the law cannot be expected to accept any such excuses or mitigations. After reading this book one feels more strongly than ever the uselessness of treating the delinquent individual himself without making any effort to treat the environment from which he has come. A detailed statistical summary is included as a detached document, and the author incorporates a useful summary of arguments at the end and a guide to the contents at the beginning of each chapter.

F. H. TAYLOR.

* *The Adolescent Criminal*, W. Norwood East, with P. Stocks and H. T. P. Young London, 1942.

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*Effect of Trimethadione (Tridione) and Other Drugs on Convulsions Caused by Di-
 Isopropyl Fluorophosphate (D.F.P.).*

Trimethadione in doses of 200-400 mg./kg. restores the normal electroencephalogram after the production of *grand mal*-like electrical patterns in rabbits by D.F.P. Trimethadione when administered before D.F.P. prevents the establishment of the seizure pattern, though not of milder types of excessive activity. A profound fall of cholinesterase activity is observed, and presumably acetylcholine accumulates. Despite its valuable therapeutic effects trimethadione does not hinder the extreme decrease of cholinesterase activity.

Atropine, like trimethadione, both prevents the electrical seizures and restores the control electroencephalogram after the abnormal brain waves have been evoked by D.F.P., and yet the cholinesterase activity is also greatly diminished and to the same extent as it is in the absence of atropine. Pentothal has been used successfully to restore the normal electroencephalogram after seizure patterns have been produced. Phenobarbital possesses both preventive and curative effects while dilantin has been used only to keep the convulsive pattern from occurring. Like trimethadione, however, dilantin permits some excessive electrical activity.
 (Authors' abstr.)

Continuous Sleep Treatment. Observations on the Use of Prolonged, Deep, Continuous Narcosis in Mental Disorders.

Experience with 70 applications of prolonged narcosis in psychotic and psychoneurotic disorders is presented. One fatality occurred in the series as a result of pulmonary emboli.

Special attention was given to the study of bronchopneumonia, an outstanding complication of prolonged narcosis therapy, and a suggested technique is presented that effectively reduces this and other hazards.

Psychotic excitements, both manic and schizophrenic, respond to narcosis therapy.

Of 7 cases of dementia praecox less than one year in duration, 6 responded well to treatment.

Experience with psychoneurotic patients is not sufficient to warrant conclusions; therapeutic results, however, were sufficient to suggest the possibility that this procedure might be of value in various psychoneuroses, particularly severe anxiety states with prominent phobic features.

The outstanding disadvantage of narcosis is the necessity of constant nursing attention during treatment. (Authors' abstr.)

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The Anticipation and Prevention of Cardiac Complications in Electroconvulsive Therapy. A Clinical and Electrocardiographic Study.

1. It seems likely that "functional" deaths immediately following electroconvulsive therapy are brought about by vagal mechanisms described.

2. Atropine is a safe premedication and consistently prevents vagal post-convulsive cardiac irregularities.

3. The effective administration of oxygen after the convulsion is important in preventing other unfavorable cardiac reactions.

4. The judicious use of digitalis, quinidine, aminophylline, and other supportive medications during treatment period is of value in patients with heart disease. (Authors' abstr.)

Insulin Shock Therapy, A Statistical Survey of 393 Cases.

1. Insulin shock therapy was found to be effective in the treatment of 182 cases of schizophrenia in the following terms: discharged from the hospital, 34.1 per cent.; remained discharged after a period of 21 to 75 months, 19.8 per cent.; and full social recovery (after that period of time) estimated at about 6 per cent. These figures indicate that insulin shock therapy is certainly not sufficient as a sole form of treatment in schizophrenia. It may have more value when used as a preliminary approach to psychotherapy or milieu therapy. On the other hand, the low social recovery rate, after 40 months (average) of evaluation, is discouraging.

2. Race was not a significant factor in this form of therapy.

3. The older the patient the better the remission status following therapy, i.e. fewer relapses occurred.

4. There was no indication that insulin shock therapy is especially effective in any particular type of schizophrenic reaction.

5. The effectiveness was found to decrease as the length of illness prior to therapy was increased.

6. Of 182 schizophrenic patients showing remission after a course of insulin shock therapy as the first form of shock treatment, 41.0 per cent. later suffered relapses, within a time evaluation period averaging 3½ years.

7. Insulin shock therapy was effective in some patients (17.0 per cent. of cases) who had failed to respond with electroshock treatment.

8. Electroshock therapy was effective in some patients (15.0 per cent. of cases) who had failed to respond with insulin treatment.

9. A second course of insulin treatment was found to be of very little value if the patient had failed to respond with the first course.

10. The level of the fasting blood sugar prior to insulin shock therapy had no effect on the outcome of the treatment.

11. Almost invariably a substantial gain in weight was produced during the course of insulin shock therapy. This had little bearing on the ultimate improvement of the patient.

12. The length of treatment was of no value in estimating the prognosis.

13. Convulsive attacks during insulin coma seemed to have a favorable therapeutic effect.

14. There was no marked change in blood pressure following insulin shock therapy.

15. Paranoid schizophrenics required a smaller dosage of insulin to produce symptoms of hypoglycemia than did the other types of schizophrenia.

16. Insulin shock therapy can be expected to produce certain complications and a mortality rate of about 0.5 per cent. (Authors' abstr.)

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Thiopental U.S.P. (Pentothal®) Treatment of Alcoholism.

1. Thiopental (pentothal[®]) sodium is a valuable addition to the treatment of alcoholism.
2. Thiopental has a remarkable ability to relieve the nervous and emotional tension that so often causes the alcoholic person to drink.
3. Thiopental is best combined with conditioned reflex aversion treatments and psychotherapy.
4. A follow-up study on 470 unusually difficult patients treated with thiopental alone or combined with conditioning and psychotherapy over a period of three years showed that 57 per cent. still were abstinent.
5. Thiopental has a pharmacologic effect in alcoholism over and above the benefits of the associated psychotherapy.
6. The physical and mental relaxation produced by thiopental is much more dramatic in the alcoholic neuroses than in non-alcoholic neuroses.
7. Thiopental therapy is in part a substitutive therapy. It gives much the same relief from tension as that afforded by alcohol, without the harmful effects of the latter. Its use can be controlled by the physician and gradually withdrawn as the patient learns to live without alcohol. (Authors' abstr.)

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Lead in Relation to Disseminated Sclerosis.

(1) A review of the history of association of lead with diseases of the central nervous system has been made.

(2) The lead content of the soil has been studied in the homes of country cases of disseminated sclerosis, all of whom had long been resident in their villages. It was found that in the soil of one village the lead content was significantly high. The incidence of the disease in the two villages studied was abnormally great compared to findings in other areas.

(3) Lead as an occupational hazard is discussed in relation to cases resembling disseminated sclerosis.

(4) The lead content of the teeth of cases of disseminated sclerosis has been found on the average to be significantly higher than control groups.

(5) It is suggested that this evidence implies that lead does play some part in the aetiology of disseminated sclerosis. It is suggested that lead may interfere

with some essential mineral, vitamin, or enzyme reaction and thus precipitate demyelination. This is discussed in relation to other diseases of the nervous system. (Authors' abstr.)

Survival in Disseminated Sclerosis: A Clinical Study of a Series of Cases First Seen Twenty Years Ago.

(1) A series of 40 unselected patients with disseminated sclerosis, all of whom lived in the same district and were seen twenty years ago, has been reviewed; 28 have died and 12 or 30 per cent. survive.

(2) The average duration of the disease among the 28 dead patients was approximately twenty years; when the whole series has died, this average will naturally be still greater and the inclusion of the survivors at present indicates that the average for the whole series will be somewhat greater than twenty-two years. About 40 per cent. of those now dead lived over twenty years. Possible explanations of this apparently high average have been discussed and it seems probable that it may be due to the natural survival period in the disease being much longer than has hitherto been supposed. Longevity in patients who survived longer than their fellows was usually only purchased at the expense of years of severe disablement. In the majority of those observed half the total illness was spent in this way.

(3) Coma often occurred as a terminal event in severely disabled patients and was sometimes preceded by frequent recurring epileptiform fits. Acute pulmonary complications, sepsis from bed sores and toxæmia from pyelitis are among the most frequent determining causes of death.

(4) Experience with these cases supports the general view that initial recovery of function usually follows a mild type of onset and that with more severe symptoms only partial recovery of function is likely to occur. Many patients, however, with severe initial symptoms have survived long periods though there has been some persistent disability from the onset.

(5) The tendency for symptoms to be repeated in subsequent relapses is observed as also the curious dissociation that exists between ophthalmoscopic appearances and visual acuity after acute retrobulbar neuritis.

(6) The almost stationary clinical condition exhibited by many of the survivors suggests that some self-limiting or defensive process is at work. It is considered unlikely that in these cases the disease is no longer active.

(7) Among the survivors there is relatively little evidence of gross sphincter disturbance, loss of emotional control or intellectual impairment. The preservation of these functions may be an important factor in the prognosis.

(Authors' abstr.)

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Personality Changes After Pre-frontal Leucotomy.

Instead of giving a detailed summary, an attempt will be made to outline the post-leucotomy patient's personality characteristics, in so far as these have been ascertained on the basis of objective tests. This outline supports more clearly after 9 months than after 3 months the hypotheses with which this paper opened.

Measures associated with neuroticism show a decrease; the patient is less suggestible, has smoother work curves, and has a changed attitude towards himself. The decrease in measures characterizing the anxious, depressive, introverted type is very marked. He is less persistent in a situation requiring endurance; he blames himself less and for fewer characteristics; he lives less in the past and more in the present and future; he has lower motor perseveration scores; he goes more for speed and less for accuracy; he shows a greater appreciation of sex jokes in comparison with non-sex jokes. He has dropped in verbal intelligence scores and shows a slight gain in performance scores.

On the intellectual side he shows a loss in verbal I.Q., a particular loss in comprehending social attitudes unrelated to his immediate environment, and a loss in learning ability. He has gained on routine tasks but loses on tests where impulsiveness is penalized. He shows a less critical attitude in his use of language.

Nearly all these changes appeared after 3 months; the confirmation of their presence after 9 months provides strong grounds for believing that with this particular operation these are some of the changes which can be anticipated in this type of population.

The Connecticut Lobotomy Committee (1948) report that if a change is to appear in a leucotomy patient it appears after 3 months. We have found this to be true about many traits, but there are exceptions. Some changes are clearly shown only after 9 months, some tendencies are accentuated and some are damped down. For example, motor perseveration and persistence involving endurance continue to decrease during the year after operation; speed and mistakes continue to increase. Increased distractibility manifests itself clearly only after the longer period and reversed the earlier impression. Planning, as measured on the Mazes, appears to improve after the early loss, and so on.

There was a suggestion in the author's results of the relationship between some of the scores on the self-blame questionnaire (and the changes in the degree of self-blame) and prognosis. This pointer will be followed up and the relationship ascertained between the personality pattern prior to leucotomy and the success of the operation. It is hoped also to ascertain the relationship between the extent of the changes and the mental health of the patient after leucotomy.

Some of the changes reported here may be regarded as undesirable. Whether they are inevitably associated with the operation of leucotomy, in which a more anterior, less extensive or unilateral cut is made, remains to be shown. The investigations which have been described are now being carried out on patients who are undergoing rostral, unilateral and bilateral leucotomy at St. George's Hospital. The number of cases to date makes it impossible to give anything but highly tentative conclusions at this stage. There is, however, a distinct impression that some of the changes reported are less marked if the operation is less extensive.

(Author's abstr.)

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Some Observations on the Brain Rhythms After Surgical Removal of a Cerebral Hemisphere.

The surgical removal of an atrophic right cerebral hemisphere in a patient with hemiplegia, epilepsy and mental disturbances was followed by an abolition of the attacks and of the slow activity in the contralateral hemisphere which had previously been greatly disorganized. This finding appears to be an argument in favour of hemispherectomy for the treatment of such cases.

Sensory stimulation of the same side of the body as the spared hemisphere produced a depression of the normal cortical rhythms indicating ipsilateral projection of the sensory impulses in this case, in which considerable sensation was also preserved on the left side.

The electrical activity of the spared hemisphere was also conducted physically to the opposite side of the head. (Authors' abstr.)

The Electroencephalographic Changes after Hemispherectomy in Man.

The electroencephalographic findings in four cases of right hemispherectomy are presented. In three cases the voltage of the activity on the unoperated side was markedly diminished; in one case unchanged.

In all four cases a rhythm in the alpha range was present on the hemispherectomized side.

In one case photic stimulation induced a better response on the operated than on the unoperated side; in another case the reverse was true.

(Authors' abstr.)

The Epileptogenic Effect of Subcortical Alumina Cream in the Rhesus Monkey.

1. Following injection of 0.1-0.2 ml. of alumina cream into various subcortical cerebral sites, recurrent convulsive seizures appeared with lesions in the following positions: medial nuclear groups of the thalamus bilaterally, putamina bilaterally, the region of the subcallosal fasciculus and the white matter adjacent to the cingulate sulcus.

2. No seizures occurred as a result of lesions in: lateral nuclear groups of the thalamus unilaterally or bilaterally, hypothalamus, tegmentum of the pons and decussation of the brachium conjunctivum, or caudate nucleus of one side and putamen of the opposite side.

3. E.E.G. abnormality was associated with all but one of the lesions, but was more pronounced in the monkeys exhibiting seizures.

4. Although the size and shape of the lesions varied markedly, their histologic appearance was uniform. (Authors' abstr.)

Encephalosyncope or Larval Epilepsy: A Follow-up.

1. One hundred and eleven of a group of 180 patients who had "larval epilepsy" or "encephalosyncope" have been followed for a period of 4-6 years.

2. 92 per cent. are gainfully employed.

3. 20 per cent. have remained free of symptoms without medication.

4. 80 per cent. have had spells of some kind.

5. 13 per cent. have had more than 3 convulsions and would justify the clinical diagnosis of epilepsy.

6. Aside from this 13 per cent., the others continue to form a homogeneous group and justify the distinctive diagnosis of "larval epilepsy" or "encephalosyncope." Their commonest symptoms are dizziness, "blackouts" and spells of blurred vision.

7. Of those who originally had a convulsion, 60 per cent. have had none since. When a convulsion has occurred, there has nearly always been a history of severe unusual mental, emotional or physical strain; or alcohol has been an obvious precipitating factor.

8. Only 4 per cent. of those who showed bilaterally synchronous 3/sec. spike and wave patterns have not had a convulsion.

9. About 50 per cent. of those who showed a diffuse dysrhythmia have not yet had a convulsion, though many have had other symptoms, such as sudden loss of consciousness, sudden dizziness, blurred vision, etc.

10. The prognosis of those with 6/sec. rhythms and variants is between these two extremes, and there were only 28 per cent. who did not report a convulsion as yet.

11. Under civilian conditions, the prognosis is quite good, and only a few of these persons are disabled by their illness, if they take simple precautions.

12. Under stress-producing conditions, spells are much more likely to occur, with obvious danger to the patients and those around them.

13. Any person who has suggestive symptoms should have an E.E.G. done, especially if he is placed in a position of responsibility and stress. If the E.E.G. is abnormal, including hypersensitivity to hyperventilation, Metrazol or photic stimulation, he should be eliminated from aircrew, tank operations or similar hazardous occupations.

14. There is considerable presumptive evidence that the disorder is subcortical and that there are three types of E.E.G. disturbances which originate in the upper brain stem. Each of them activates a separate but closely-related group of neurones. (Authors' abstr.)

Effect on the Electroencephalogram of Transorbital Lobotomy.

Electroencephalograms taken before, during and after bilateral transorbital lobotomy on two cases operated with electroshock as anaesthesia failed to show development of slow activity; one case showed a marked but transient increase in alpha activity. Pre- and post-lobotomy records on a third case operated under Pentothal were likewise free of slow activity. No case showed impairment in the amount, frequency and distribution of natural sleep spindle activity.

(Author's abstr.)

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Effects of Glutamic Acid on Maze Learning and Recovery from Electroconvulsive Shocks in Albino Rats.

Two experiments are reported in which the maze performances of rats on diets rich and poor in glutamic acid (calcium L-glutamate) are contrasted. The first experiment used 131 weanling rats in nine groups, involving three different diets and three conditions of testing. The diets were (a) a synthetic one of very low 0.5 per cent. glutamic acid content, (b) the same synthetic diet supplemented to six per cent. of glutamic acid, and (c) a natural diet naturally rich in glutamic acid. The conditions of testing were the learning of a Warden-U water maze before, during and after, and relearning after a 10-day series of E.C.S. There were no reliable differences in the performances of groups on different diets.

The second experiment used 50 prepubescent rats in four groups, all somewhat debilitated by a diet nutritionally incomplete. The food of two groups was supplemented with glutamic acid. Midway in the training period one group on the supplemented diet and one on the basal diet were given a 10-day series of E.C.S. Again there were no reliable differences in performances due to the different diets.

The results are discussed in relation to the positive results reported from one laboratory and the reported clinical usefulness of glutamic acid. It is suggested that if tests of spontaneous activity should prove to be negative also, then glutamic acid must affect behaviour only in animals suffering a metabolic deficiency of unknown nature. (Authors' abstr.)

Studies of Anxiety: (1) The Production of a Feeding Inhibition in Dogs.

1. A feeding inhibition may be produced in normal dogs in one to four shock trials if shock is applied while the eating response is occurring. Feeding inhibitions are not effectively established if shock is applied prior to eating or while the food is being delivered into the food box. The temporal relations of conditioned and unconditioned stimuli, as well as the occurrence or non-occurrence of the response, thus appear to be of considerable importance. Anxiety symptoms may be pronounced even when inhibition is unstable.

2. Once established, the feeding inhibition is relatively stable, lasting for weeks or even months without further shock reinforcement.

3. General changes appear in the behavior of all dogs with the development of the feeding inhibition although the particular pattern of behavior varies considerably from animal to animal. These changes include:

(a) Passivity or immobility in the experimental situation, a symptom frequently observed;

(b) Struggle, barking and biting, seen in only a few animals;

- (c) Resistance to entering the stock which may develop slowly over a period of several days ;
- (d) Tremors, present throughout the experimental session, but which are intensified when food is delivered ;
- (e) Disturbed respiration throughout the experimental session, and a sudden inspiration when food is delivered ;
- (f) Tic-like movements conditioned to the appearance of food and persisting long after shocks have been discontinued ;
- (g) Aversion of the head from the food box ;
- (h) Retching in the presence of food pellets ;
- (i) Refusal to eat in the living cage ;
- (j) Increased aggression against cage-mates ; and
- (k) Depression in general activity level.
4. A prominent feature of the anxiety symptoms is their tendency to develop and fixate after shock reinforcement has been discontinued.
5. Feeding inhibitions may be temporarily relieved in some animals by altering one or more aspects of the experimental situation. Some animals will eat when the experimenter is present in the room and some will eat when the harness is removed. Other dogs, however, cannot be made to eat in the experimental room even under considerably altered conditions. (Author's abstr.)

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Psychologic Effects of Electric Convulsive Treatments. I. Post-Treatment Amnesias.

(1) Definite and consistent evidence of circumscribed amnesias was found following electric convulsive treatments. Approximately four weeks after the termination of treatments, every one of the 19 electroshock-treated patients was unable to recall some of the memories of past experiences which had been elicited in the pre-treatment interview. Such failures occurred so infrequently among the 11 control patients as to be almost negligible.

(2) In a follow-up study on 5 of the electroshock-treated patients it was found that in each case most of the instances of retroactive amnesia persisted as of two and one-half to three and one-half months after termination of the treatments. This finding bears out the preceding one in supporting the general conclusion that a series of electrically induced convulsions, as administered in standard psychiatric practice, produces circumscribed amnesias for past experiences which persist beyond the usual period of recovery during which the temporary organic reactions to the treatments clear up.

(3) In the post-treatment interviews of electroshock-treated patients it was noted that in addition to the definite retroactive amnesias there were numerous instances of recall failures which were purely temporary in that the patient subse-

quently was able to remember some material which he could not recall at first. If it is assumed that such temporary recall failures involve the same basic defect as the more persistent recall failures, the post-treatment amnesias may be regarded as recoverable rather than as representing a permanent retention loss.

(4) There is some evidence that following electric convulsive treatments extra effort is required for overcoming the difficulty in producing personal memories, when the patient attempts to remember his past experiences. Observations on motivational aspects of the post-treatment amnesias provide some support for the hypothesis that those memories which tend to evoke guilt, lowered self-esteem or other painful affective reactions may be less likely than others to be recalled because the patient is motivated, consciously or unconsciously, to avoid expending the added effort required for producing them. According to this hypothesis, the general difficulty in producing personal memories may facilitate the forgetting of certain (disturbing) past experiences. This might prove to be a basis for explaining the occurrence of sustained amnesic gaps following electric convulsive treatments. (Author's abstr.)

Psychologic Effects of Electric Convulsive Treatments. II. Changes in Word Association Reactions.

Seventeen mental patients who received a minimum of 10 electric convulsive treatments were given a word association test before the electroshock series began and again four weeks after the series had ended. When the changes in their performances were compared with those exhibited by an equated control group of 17 patients who received no form of shock treatment during a comparable time interval, the following findings and conclusions emerged :

(1) No reliable change was found on any of the following measures of delayed reaction : (a) responses delayed for three seconds or more, (b) responses delayed for five seconds or more, (c) failure to respond within the 45-second time limit. From these findings it appears that E.C.T. had no observable effect upon the frequency with which delayed associations occurred.

(2) The E.C.T. group exhibited a slight but statistically reliable increase in certain types of deviant associations : (a) remote or idiosyncratic associations, (b) stimulus repetitions, (c) multi-word responses. The E.C.T. patients showed no decrease in other types of association disturbances which would in any way compensate for the average increase in these three types of pathologic association disturbances.

(3) The E.C.T. group exhibited a statistically reliable increase in defective reproductions of the word association responses, indicating that as a result of electroshock treatments the patients tended to give a poorer performance on the reproduction test.

(4) From a qualitative examination of the three types of deviant associations which were found to increase following E.C.T., it appears that a primary characteristic is failure to maintain the " task-set " (imposed by the word association test instructions) which is necessary for producing habitual association responses. The results on defective reproductions of word association reactions are consistent with this interpretation, on the assumption that if the " task-set," is not maintained the associations are not likely to be stable, habitual ones. Consequently the results of this investigation lend tentative support to the following hypothesis : the post-treatment amnesias and related difficulties in producing personal memories following electric convulsive treatments may arise from a basic disturbance in recall processes, consisting of an increased tendency to produce spurious, irrelevant associations which interfere with the production of the habitual associations necessary for evoking the recall of personal past experiences. (Author's abstr.)

Psychologic Effects of Electric Convulsive Treatments. III. Changes in Affective Disturbances.

(1) On a variety of self-rating scales of affective attitudes, the E.C.T. group, when examined approximately four weeks after the last treatment, showed a marked decline in affective disturbance scores, as compared with the equated control group. The results support the general conclusion that a series of electroshock treatments tends to produce a reduction in affective disturbances.

(2) The scales on which the E.C.T. patients exhibited the most reliable decline in affective disturbance scores were mainly those which are relevant to the "depression" syndrome, as described in the psychiatric literature. Consequently, the results tend to support the widely-accepted hypothesis that electroshock treatments are primarily effective in alleviating affective disturbances tied up with depressive symptoms.

(3) It was found that even when clinical improvement status was held relatively constant, the E.C.T. patients still tended to show a greater decline in affective disturbance scores than the control group. This finding supports the hypothesis that E.C.T. tends to produce a reduction of affective disturbances even when the treatments fail to alleviate the patient's dominant psychopathologic symptoms.

(4) Various qualitative observations provide some direct evidence for a hypothesis which appears to be plausible in the light of the quantitative findings, namely, that the occurrence of post-treatment amnesias may be closely related to the decline in affective disturbances.

(5) The possible role of post-treatment amnesias in producing the affective changes was discussed in the context of alternative causal sequences. From the available evidence, it appeared to be improbable that the amnesias are the primary causal factor producing the therapeutic changes in affective symptoms. But some qualitative evidence was presented which implies that the amnesias do contribute to the reduction of affective disturbances, probably as a secondary factor which aids in reinforcing and maintaining the therapeutic results of the treatments. The following hypotheses, which appear to be consistent with the findings and observations derived from the present series of investigations, were suggested as warranting further research:

a) By partially eliminating from the patient's consciousness a substantial block of memories which tend to arouse intense affect, the post-treatment amnesias may have the effect of reducing certain areas of affective disturbance. In other words, the post-treatment amnesias may be equivalent to a new mode of defense which has an effect similar to "repression" in facilitating the avoidance of disturbing affect.

b) By providing a new defense mechanism for warding off intolerable subjective states and thereby reducing the frequency and intensity of disturbing affective reactions, the post-treatment amnesias may contribute to the abandonment of some of the pathologic symptoms which had previously functioned as a defense against intense affective reactions.

(Author's abstr.)

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Uraemic and Trophic Deaths Following Leucotomy: Neuro-Anatomical Findings.

In a series of 22 leucotomy cases dying within six months of the operation, analysis of the causes of death reveals two distinct groups: Group 1, dying predominantly from uraemia in the third post-operative week, and Group 2, dying predominantly from trophic deterioration (marasmus with trophic skin lesions), between two and five months after the operation. In the latter group blisters or bullae almost always appeared on the extremities between the fourth and sixth post-operative weeks.

Post-mortem anatomical (mainly macroscopic) analysis of the lesions in the frontal lobes of these 22 cases revealed a striking association of death from uraemia with bilateral damage to the posterior (non-granular) orbital cortex, and of death

from trophic deterioration with bilateral cutting of the region of the subcallosal fasciculus at the level of the head of the caudate nucleus.

The orbital cortex concerned in the uraemic deaths appeared to be posterior area 47, not area 13. Histopathological evidence of nutritional deficiency was not conspicuous among the cases of trophic deterioration.

From evidence supplied by these and other relevant cases, in a total series of 122, it is deduced that connexions between the caudate nucleus and Brodmann's (non-granular) cortical areas 8 and 6 (including their mesial extension towards the corpus callosum), via the rostral parts of the subcallosal fasciculus, may be the structures whose damage determined the fatal trophic deterioration.

The practical intention of the paper is to emphasize the serious danger of delayed operative death from the use of blind leucotomy techniques, including the "deep" transorbital cut. (Author's abstr.)

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The Central Auditory Pathway.

Unipolar recordings of responses to click stimuli have been taken from various stations along the auditory pathway in anaesthetized cats. Monaural and binaural stimulation were employed, and parts of the pathway were deleted surgically in some of the experiments in order to study changes from normal responses at the several stations resulting from elimination of various components.

Latency of response increases at successively higher levels, making possible presumptive determination of number of synapses to a given point. Duration and amplitude of response also increases at successively higher levels, indicating progressive temporal dispersion. This is accompanied by a progressive tendency toward smoothing of the wave form as more and more elements are activated at

each higher level and their summed potentials merge, obscuring the identity of the various contributions.

Difference in latency of response of inferior colliculus to ipsilateral and contralateral stimulation plus difference in the earliest peak or shoulder of the collicular and brachial responses indicate one more synapse in the ipsilateral pathway than in the contralateral. Second-order fibers form the chief contralateral component up to midbrain level, while the earliest ipsilateral midbrain response is that of third-order fibers. At thalamic and cortical stations, this difference is compensated by longer nuclear delays.

The trapezoid body is by far the most important site of crossing in the cortical projection pathway for hearing. The commissure of the inferior colliculus may contribute slight additional opportunity for decussation, but is more probably principally concerned in commissural communication necessary to integrative processes at midbrain level.

Implications of the data for auditory theory are discussed.

(Authors' abstr.)

Stimulation and Strychninization of Supracallosal Anterior Cingulate Gyrus.

1. By physiological neuronography, the authors confirmed the work of others that fibres from the anterior cingulate gyrus project to areas in the vicinity of areas 31, 32, 6a and 4s. In addition, they have also found the transmission of strychnine spikes to areas in the presumptive location of 8s, 2s and 19s.

2. Electrical stimulation of the anterior cingulate gyrus was carried out in cats and monkeys, and the following effects were observed: (i) atypical motor movements; (ii) arrest of motor movement; (iii) arrest of respiration; (iv) electroencephalographic changes. All of these effects occurred independently of each other.

3. The electroencephalographic effects were of four types: (i) suppression of strychnine spikes (ipsilateral); (ii) suppression of spindles (ipsilateral); (iii) suppression of spontaneous electrocortical activity (bilateral); (iv) production of a seizure discharge (ipsilateral or bilateral). All of these electroencephalographic effects occurred independently of one another.

4. The independent occurrence of the effects of anterior cingular gyrus stimulation suggests that they are mediated by independent pathways. The authors' results would indicate that suppression of strychnine spikes, suppression of spindles and arrest of motor movements are mediated via the caudate nucleus (not necessarily the same part).

(Authors' abstr.)

Chronic Focal Hyper-irritability of Sensory Nervous System in Cats.

1. Chronic focal hyper-irritability of sensory cutaneous areas has been produced in cats by application of alumina cream above the dorsal aspect of the lumbar cord.

2. This hyperesthesia and hyperalgesia develop over a period of days to weeks. Once they become maximal they are permanent for at least nine months (the longest period of the author's observation).

3. The hyper-irritable regions develop first near the spinal segments at the site of injection and then spread to involve many segments in either direction.

4. Light touch, heavy touch or pain stimuli all become disagreeable and apparently painful to the animals over the affected areas. Light touch has seemed to be the most disturbing type of stimulus.

5. There is a hyper-reflexia but no other change in motor status. Proprioception has been normal except in three instances when it was affected for the first week after operation, probably as a result of operative trauma.

6. The condition which develops is similar in many ways to that seen when the same substance has been applied to the motor cortex producing chronic recurrent epilepsy.

7. In many respects it is like the causalgic state which is seen in man.

(Author's abstr.)

Lack of Regeneration in Spinal Cord of Rat.

1. The spinal cord of 159 rats was cut across in the midthoracic region. The cord ends were completely visualized to ensure complete transection.

2. Fresh sciatic nerve, degenerated sciatic nerve and muscle were both auto- and homo-transplanted into the gap between the cord ends in various groups of animals. A tantalum cuff or cylinder was inserted over the cut cord ends in another group.

3. The animals were kept alive for varying periods up to 168 days.

4. No return of function was found beyond that of a "spinal" animal.

5. Silver-stained sections of the spinal cord showed no evidence of any but the feeblest sort of regeneration. An exception to this was the invasion of the scar tissue by root fibers.

6. Connective tissue invaded the space between the cord ends, but so feeble was the regenerative impulse that it was felt that the presence of the connective tissue was not of primary importance. (Authors' abstr.)

Corticocortical Connections of Posterior Wall of Central Sulcus in Monkey. (Macaca mulatta).

The efferent connections of the cortex of the posterior bank of the central sulcus have been investigated by physiological neuronography in the monkey (*Macaca mulatta*). This koniocortex, histologically distinct from the homotypical cortex on the postcentral convolution, has strongest connections with the cortex just behind and in front of the central sulcus. The more inferior portions of the buried sensory cortex have strong connections with the cortex between the Sylvian and intraparietal sulci. The mild firing into the posterior end of the superior temporal sulcus is probably the surface extension of firing into the superior walls of the Sylvian fissure, found by exploration after subpial resection of the superior temporal gyrus.

Feeble contralateral connections are localized to corresponding regions of the posterior bank of the central sulcus.

Except for meagre connections with the cortex between the lower parts of the arcuate and central sulci, and those in the posterior part of the superior temporal gyrus, the connections of the sensory koniocortex of the central sulcus do not differ markedly from those of the surface of the post-central gyrus.

No connections were found between the posterior bank of the central sulcus and the cortex behind or below the superior temporal sulcus or with one minor exception, in front of the arcuate sulcus. (Authors' abstr.)

The Repetitive Discharges of Corticothalamic Reverberating Circuit.

1. In response to an afferent stimulation the sensory cortex gives rise to a potential change consisting of a primary response followed by a series of 3-13 regularly spaced waves. Cortical responses of this pattern can be produced in every sensory system, although there may be some variations in frequency in different systems.

2. The frequency of the repetitive discharges is independent of the stimulus intensity but varies with the state of anesthesia.

3. The waves of repetitive discharge can be distinguished from the spontaneous cortical activity by their difference in frequency, wave form and phase relations.

4. The massa intermedia of the thalamus plays no role in the performance of the specific repetitive discharges.

5. Responses of a pattern similar to that recorded from the cortical surface can be recorded also from the corresponding thalamic structures. Such responses can be completely abolished, however, either by removal of the concerned cortex or by the interruption of the corticothalamic connections.

6. A series of waves in a pattern similar to that of repetitive discharge evoked by sound stimulation can be recorded from the auditory cortex by electrical stimulation of a cortical point close to the recording electrode. This cortically-induced repetitive discharge fails to appear after the medial geniculate body is destroyed or the auditory radiation fibers are interrupted.

7. On the basis of the above experimental evidence it is suggested that the periodically recurring cortical waves following an afferent stimulus are the repetitive discharges of reverberating circuit between the thalamic structures and the corresponding sensory cortex.

8. By an analysis of the time relations and the interactions of the primary response and the subsequent repetitive discharges it was found that the ascending

pathway of the corticothalamic reverberating circuit does not share the same neurons as those mediating the great afferent volleys. (Author's abstr.)

Effect of Bulbar Facilitation and Inhibition on Peripheral Reflex Inhibition.

In anesthetized cats, studies were carried out on the effect of the bulbar inhibitory and bulbar facilitatory systems on reciprocal inhibition as recorded by the actions of the biceps-quadriceps and the tibialis-gastrocnemius pairs in response to ipsilateral or contralateral sensory nerve stimulation. Additional studies were made on the effect of these systems on ipsilateral sensory nerve inhibition of the recurrently elicited knee-jerk.

Stimulation of the bulbar facilitatory system enhances both the excitatory and inhibitory components of reciprocal inhibition, but activation of the bulbar inhibitory mechanism abolishes both of these phases. In the case of reflex inhibition of the knee-jerk, bulbar inhibition sums with and bulbar facilitation opposes the effect. These results are explained on the basis, that the spinal projections of the bulbar facilitatory and inhibitory systems influence the involved spinal reflex arcs at some early synapse in the arc. (Author's abstr.)

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An Experimental Analysis of Biochemically Induced Circling Behavior.

1. The unilateral intracarotid injection of D.F.P. produces a reversible biochemical lesion which induces temporary circling behavior arising in a central or cerebral locus.

2. The biochemical lesion, i.e., the decrease in cholinesterase activity as well as the corrective effects of atropine and scopolamine indicate a cholinergic mode of origin for the forced circling behavior.

3. The peripheral vestibular system can influence the cerebral circling response in rabbits and cats but not in monkeys. (Authors' abstr.)

Visual Areas I and II of Cerebral Cortex of Rabbit.

1. The cortical area of the rabbit which responds with typical surface-positive waves to gross contralateral photic stimulation extends about 15 mm. anterior to the occipital margin of the hemisphere. Its medial border is at the splenial sulcus or 1-2 mm. medial to the sulcus and its lateral border is about half-way down the lateral surface of the brain.

2. The portion of the visual area which responds to gross ipsilateral photic stimulation is in the form of a band extending diagonally from the anteromedial to the posterolateral portion of the visual area.

3. The vertical meridian for binocular vision is situated 20 degrees from the sagittal plane of the visual field of the deeply anesthetized animal and when projected on the cortex it divides the binocular area into approximately equal parts. The visual area anterolateral to this line shows a pattern on localized photic stimulation resembling a mirror image, on a smaller scale, of the visual area which lies posteromedial to this line. The authors have designated the larger posteromedial area visual area I and the smaller anterolateral area visual area II.

4. The horizontal meridian projects close to the posterior edge of the dorsal surface of the cerebrum except for a marked anteromedial dip along the vertical meridian for binocular vision. The upper visual field is represented to about 15 degrees above the horizontal meridian and the lower visual field to more than 20 degrees. The lateral visual field has been found to be represented to more than 150 degrees from the sagittal plane in both visual area I and visual area II.

5. The responses obtained from visual areas I and II under deep anesthesia were similar in form, amplitude and latency. (Authors' abstr.)

Physical Significance of Strength-duration Curve for Excitation of Nerve.

Rectangular current threshold stimuli of various durations were applied to fiber bundles of the frog sciatic nerve from which the perineural sheath had been dissected. In such a system, threshold for the most irritable fibers is attained when the electrotonic potential at the cathode reaches a critical value, regardless of its time rate of change.

It is thought that removal of the sheath allows the system to approximate an ideal one in which a single fibre is surrounded by a very thin film of fluid. In such an ideal system an extrapolar electrotonic potential must be proportional to the potential difference across the membrane capacity induced by flow of the stimulating current.

Hence it is concluded that local attainment of a critical outwardly-directed potential difference across the distributed membrane capacity is sufficient for excitation in the absence of appreciable accommodation. (Authors' abstr.)

Effect of Section of Vestibular Nerve Upon Cortically Induced Movement in Cat.

1. The effect of vestibular nerve section on a cortically-induced motor response has been studied in the cat.

2. Using near-threshold stimulation of the motor cortex, the motor response in a limb is markedly diminished or abolished following section of either 8th nerve.

3. It is concluded that the vestibular nerves contribute afferent impulses which maintain a certain background activity in some part of the facilitatory system. Following section of the vestibular nerve, it appears that such reverberative activity requires a measurable length of time to die out. Furthermore, markedly increasing the strength of cortical stimulation may mask or compensate for this effect in the static animal. (Authors' abstr.)

An Analysis of Primary Response of Visual Cortex to Optic Nerve Stimulation in Cats.

1. The primary cortical response to optic nerve stimulation as picked up by an active electrode leading from the cortical surface of gyrus lateralis of cat under Nembutal anesthesia was differentiated into 6 deflections.

2. The first deflection, consisting of a diphasic or triphasic small wave with a very short latency, was interpreted as being caused by the potential difference in the transient electrical field created by a synchronous volley travelling along the optic nerve in a volume conductor.

3. Deflections 2, 3 and 4, all of which are surface-positive spike-like potentials with the latent periods of 1.6-1.7 m.sec., 2.7 m.sec. and 3.3 m.sec. respectively, were resistant to superficial application of novocaine, strychnine and to mechanical pressure. They are assignable to the activities of three systems of geniculocortical neurons.

4. Deflection 5 is the most prominent and broad wave, varying in size with the stimulus strength. It could be abolished selectively by the exertion of mechanical pressure on the cortical surface, attenuated by local application of novocaine, and greatly enhanced by superficial strychninization of the cortex. It disappeared earlier during anoxia by breathing pure N_2 and recovered later on readmission of air than the preceding components. Intracortical neurons were assigned as the origin of this potential.

5. The long-lasting negative potential following wave 5 may be an indication of the passage of impulses in the apical dendrites of pyramids and the activity of other cortical internuncial neurons.

6. It is suggested that the complex form of the primary cortical response to optic nerve stimulation is made up of an initial wave caused by the changing field of action current flowing along the optic nerve and tract and three independent constituent potentials representing the activity of three systems of geniculocortical pathways, each of which consists of a spike potential and a slow wave.

7. The triple conducting pathways in the visual system might serve as separate routes mediating impulses underlying trichromatic vision. (Authors' abstr.)

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Impairment of Abstract Behavior Following Bilateral Prefrontal Lobotomy.

1. Thirty-two pre-frontal lobotomy patients were given a battery of psychological tests to investigate changes in intellectual function resulting from lobotomy.
2. The Wechsler-Bellevue Test revealed no significant reduction in general intelligence, or any evidence of impairment which could be attributed to the surgical procedure. Increased intellectual efficiency with increases in full scale I.Q. of 1 to 21 points occurred in 28 out of 32 cases.
3. The Graphic Rorschach indicated a change in personality-structure and traits, corresponding generally with changes in the clinical picture. In a large number of cases, organic features were suggested by the Graphic Rorschach, later retesting indicating they were of a temporary nature.
4. The Grassi Block Substitution Test revealed marked impairment of abstract organization and inability to shift from a concrete to an abstract approach, suggestive of organic pathology resulting from the lobotomy. The impairment, however, disappeared almost entirely within the first year.
5. Prognostic criteria might be established on the basis of the performances on the Grassi Block Substitution Test and the Graphic Rorschach. The presence of decreased scores in block performances immediately following operation, with increased scores six months later, seemed to be significantly related to the degree of clinical improvement manifested. A shift to an extreme form of blot-dominance on the Graphic Rorschach—as a result of the operation—from a previously different level of performance may also prove to be a valuable prognostic criterion.
6. The results of the psychological measurements used do not contraindicate bilateral frontal lobotomy but rather support it as a therapeutic procedure.

(Author's abstr.)

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Stress and the Adrenal Cortex with Special Reference to Potassium Metabolism.

The fact that steroids modify both brain electrolytes and certain aspects of brain function is suggestive in relation to the author's finding of abnormal adrenal stress responses in schizophrenic patients. The author has seen that normal men, in contrast to most schizophrenic patients, fluctuate in rate of potassium excretion with modification of rates of release of their adrenal steroids in response to a wide variety of stresses. The author has also seen that potassium is lost from the brain of rats in response to stress and that this loss may be prevented by certain steroids. It is tempting to consider that repeated failure of normal movement of tissue potassium accompanying a wide variety of stresses may play a cumulative

role in the development of schizophrenic behavior characterized by the establishment of conditioned responses involving inappropriate affect and disturbances of association, attention and consciousness. While there is no direct evidence for this hypothesis, and it may well be incorrect, the author presents it here as a target for criticism through further experimental tests. (Author's abstr.)

Adaptive Reaction to Stress.

1. Following a brief outline of the endocrine aspects of the General-Adaptation-Syndrome and of the so-called "Diseases of Adaptation," the participation of nervous mechanisms in these biologic reactions is considered.

2. Important alterations in the morphology and function of the nervous system can result from hypo- or hyperactivity of the pituitary-adrenal system, the main endocrine regulator of adaptive processes.

3. The coexistence of disordered endocrine mechanisms with psychoneurotic or psychotic states, suggests some relationship between pituitary-adrenal activity and mental processes. The precise nature of this relationship is not yet established.

4. Alarming stimuli of a neurogenic or psychogenic nature are particularly potent activators of the pituitary adrenocorticotrophic function and produce rapid and intense alarm-reactions.

5. The corticotrophic effect of physical stress is apparently independent from any nervous mechanism; it is not prevented either by complete deafferentiation of the pituitary, or by the administration of autonomic blocking agents.

6. However, the possibility is considered that, unlike physical stressor agents, neurogenic stimuli may require a neurohumoral mechanism to elicit the release of pituitary A.C.T.H.

7. Recent experiments indicate that many effects of mineralocorticoids are inhibited by simultaneous treatment with glucocorticoids, yet on certain target organs the two types of hormones act synergistically. The importance of these interactions is stressed in connection with the concept of the diseases of adaptation. (Authors' abstr.)

Anxiety, HCl Secretion and Peptic Ulcer Etiology.

1. It is impossible to make a critical evaluation of an oral-dependency and an anxiety hypothesis of peptic ulcer etiology solely on the basis of available anamnestic or psychoanalytic studies of personality processes in peptic ulcer patients. A method which would enable one to do so is briefly described.

2. Both the oral-dependency and the anxiety hypothesis assume that increased HCl secretion is associated with the emotional processes emphasized. There are no published experimental data, positive or negative, concerning HCl secretion during the arousal of unconscious wishes to be loved, to eat, or to be fed. There is evidence that chronic overt anxiety behavior in dogs and conscious chronic anxiety in humans are positively associated with increased HCl secretion. Some of the results are contradictory, however, and further studies, especially at the human level, are needed. Such studies also aid in resolving the contradictory predictions of HCl secretion made by Cannon's emergency theory of emotions and by an anxiety hypothesis of peptic ulcer etiology.

3. A study of the gastric acidity of male students during the undergraduate examination period and during control periods is reported. The gastric acidity of these students was significantly higher during the examination period than during the control periods. The rise in gastric acidity was very closely related to the degree of conscious anxiety manifested by these subjects. These results agree with an anxiety hypothesis of peptic ulcer etiology; they do not bear directly upon an oral-dependency hypothesis.

4. A recent critique of an anxiety hypothesis of peptic ulcer etiology and of a previous experiment of the writer is considered. It is shown that this critique did not adequately describe the experimental procedure or the results of the study it discounted. The theoretical objections raised in this critique are shown to be a function of confusion of the differential role of anxiety in the conversion neuroses and in the vegetative neuroses. The reluctance to consider the autonomic concomitants of anxiety is regarded as a joint result of the history of psychodynamic theory and the unqualified extensions of Cannon's emergency theory of emotions to chronic emotional processes.

5. Possible fruitful lines of research for a comparative evaluation of the oral-dependency and anxiety hypotheses of peptic ulcer etiology are discussed.

(Author's abstr.)

The Association of Certain Vegetative Disturbances with Psychoses.

The occurrence of various vegetative disorders in relation to psychiatric diagnosis within the population of a mental hospital in Canada has been examined and the relationship determined by statistical evaluation.

No statistically significant association between a particular type of psychosis and bronchial asthma, diabetes mellitus, rheumatoid arthritis and hyperthyroidism could be demonstrated.

A statistically significant association was found between peptic ulcer and the manic type of manic depressive psychosis. This observation is considered in the light of the common hypothalamic mechanisms involved in the two conditions and with reference to the psychoanalytic feature of oral aggressiveness which has been described for both disorders.

Elevated blood pressure occurred most frequently in the older age group of patients and in those with involuntional melancholia. It was significantly low in catatonic dementia praecox and absent among epileptic patients. Statistical analysis indicated a negative correlation of hypertension with epilepsy even when allowing for age. Contrasts can be made between the personality characteristics which have been described for hypertensives with those present in catatonics and in epileptics.

(Author's abstr.)

The Incidence of Certain Vegetative Disturbances in Relation to Psychoses.

The incidence of certain chronic vegetative disturbances has been determined among 1,600 patients in a Canadian mental hospital. The previous literature has been discussed concerning the frequency of the disorders among psychotic patients as compared with the general population.

Peptic ulcer appears to be less common among psychotic patients than among non-psychotics. This might favor its status as a "vegetative neurosis."

Bronchial asthma is not significantly less frequent among psychotics than non-psychotics. This emphasizes the importance of physical factors or of emotional factors at a psychotic level.

Diabetes mellitus is approximately as common among psychotic patients as in an unselected population. This either favors physical factors, or the hypothesis that the relevant emotional disorders are at a psychotic level.

Rheumatoid arthritis is rare among psychotics. This might support its designation as a "motor neurosis."

An elevated blood pressure is about as common among psychotic patients as among patients in general medical practice. This might favor the presence of physical in addition to emotional factors, since the high incidence renders psychotic factors less likely.

Hyperthyroidism is not common among psychotics, but no comparative incidence for non-psychotics is available.

With minor exceptions the sex ratios for these disorders are similar among psychotic and non-psychotic individuals.

(Authors' abstr.)

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Effect of Iron Preparations on "Antabuse"—Alcohol Toxicosis.

The effect of iron on the "Antabuse"-alcohol toxicosis has been studied in 20 alcoholic patients by intravenous injections of an aromatic iron preparation, the main components of which are: ascorbic acid, 0.05 cg. and ferrous chloride, 0.0228 cg.

The experiments have been of a preliminary nature, but they indicate that intravenous injections of iron in doses as small as about 13 mg. (10 ml. of "Ferro-scorbin") have a distinct curative effect on the toxicosis produced by consumption of alcohol after a previous intake of "Antabuse." This effect is most clearly seen if the iron injection is given immediately after intake of alcohol, when the toxic symptoms can be made to disappear almost instantly (13 cases). If iron is given before intake of alcohol, the appearance of the toxic symptoms is not prevented but their development is slower than in the usual "Antabuse"-alcohol toxicosis (7 cases). The fact that certain and rapid curative effect can be achieved with relatively low quantities of iron (20 cases) will undoubtedly prove valuable in the practical treatment of alcoholism with tetraethylthiuram disulfide.

In the field of psychiatry, the following observation opens interesting therapeutic possibilities. In a rare case of amentiaform psychosis caused by "Antabuse" (without alcohol), "Antabuse"-alcohol toxicosis was produced by administering to the patient 40 ml. of cognac. The toxicosis was then cured by an intravenous injection of 10 ml. of "Ferro-scorbin." After two such treatments all symptoms of the psychosis disappeared and the patient has since been able to perform his duties as a responsible official for over a month.

The effect of iron can be explained by the following hypothesis: "Antabuse" can be assumed to act as an enzyme poison in the first phase of the alcohol-oxidizing enzyme system, in the same manner as it evidently has a poisoning effect on the oxidative metabolism of lactic acid. Considering that metals, and specifically also iron, form difficulty-soluble complexes, with "Antabuse," it is reasonable to assume that iron in the blood reacts rapidly with the absorbed "Antabuse." Upon being liberated from the enzyme-poisoning "Antabuse," the alcohol-oxidizing enzyme system can then resume its normal functions. (Author's abstr.)

The Treatment of Acute Alcoholic States with A.C.T.H. and Adrenocortical Hormones.

In summary, it appears from the author's limited series that whereas A.C.E. is effective in Korsakoff's psychosis, A.C.T.H. is not; and that both A.C.E. and A.C.T.H. are effective in the treatment of acute alcohol intoxication. In the latter condition A.C.E. is probably preferable because of its greater sedative action. In delirium tremens A.C.T.H. is the most effective treatment the author has used; it is superior to either conventional treatment or A.C.E. (Author's abstr.)

An Evaluation of the Aversion Treatment of Alcoholism.

1. The conditioned-reflex or aversion treatment of alcoholism is of value mainly for the better-circumstanced type of alcoholic patient.

2. Indigent, inadequate, psychopathic or extremely neurotic patients only occasionally respond to the conditioned-reflex treatment.

3. Although all who apply are accepted for treatment, there is an automatic selection favoring patients who are ready to undergo the treatment voluntarily and able to pay a substantial fee.

4. A follow-up study of 4,096 patients treated during a period of over 13 years by the conditioned-reflex method shows that 44 per cent. have remained abstinent since their first treatment, 60 per cent. have remained abstinent for 1 year or longer, 51 per cent. for 2 years or longer, 38 per cent. for 5 years or longer and 23 per cent. for 10 years or longer after their first treatment. Of 878 patients who relapsed and were treated again during these 13 years, 39 per cent. have remained abstinent since their last treatment. This gives an over-all abstinence rate of 51 per cent. for the period covered by this survey.

5. It is possible to evaluate the effectiveness of the various therapies of alcoholism as objectively as those of cancer, tuberculosis and many other medical conditions.

6. Conditioned-reflex therapy does not preclude other types of treatment for alcoholism and can be used with them in any combination most advantageous for the individual patient.

(Authors' abstr.)

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 year-old Girl. *Zulliger, H.* 157

1. Biochemistry, Physiology, Pathology, etc.

The Effect of Vitamin A Deficiency on the Nervous System. Campos, F. A. de Moura (Univ. Sao Paulo Med. School). [Rev. brasil med. (Rio de Janeiro), 4, 343-9 (1947); Biol. Abstracts, 22, No. 6, 1376 (1948).]

Forty-eight young rats were put on a diet without vitamin A for 3 months. Twenty-two of them showed paralysis and ataxia of the hind limbs 7-12 weeks after the beginning of the experiment. In 18 of these 22 rats the above signs appeared after they had lost weight, and in 17 the eye signs appeared before the ataxia. Campos concludes that the nervous signs have no value for the early diagnosis of the vitamin A deficiency. R. D. H. (Chem. Abstr.).

Determinations of Histamine in Cerebrospinal Fluid in some Neuropsychiatric Cases. Autio, Lauri, and Ermala, Pentti (Lapinlahti Hosp., Helsinki, Finland). [Ann. Med. Exptl. et Biol. Fenniae, 27, 87-101 (1949) (in English).]

Histamine was isolated chemically from the cerebrospinal fluid of 26 patients. The average amount obtained was 0.059 γ /ml. Women averaged 0.079, and men 0.038 γ /ml. In lumbar puncture the average was 0.091, while in cisternal it was 0.043 γ /ml. The determinations on fluid from untreated patients were similar, though not as pronounced. Histamine added to the cerebrospinal fluid seems to be bound into an inactive form from which it is gradually released.

DORIT L. NOETHER (Chem. Abstr.).

Characteristics of the Cerebrospinal Fluid in Lymphogranuloma Venereum. Finberg, Lawrence, Lord, Richard E., and Cenac, Mark T. (U.S. Pub. Health Service, Washington, D.C.). [J. Venereal Disease Inform., 30, 291-4 (1949).]

A considerable number (23.2 per cent.) of cases of lymphogranuloma venereum manifest abnormalities of the cerebrospinal fluid. The component of the cerebrospinal fluid involved appears to be chiefly the protein, with consequent changes

in the colloidal mastic test. This finding may conceivably represent the only indication of activity. At present there are no data to show that such findings are an indication of activity or that they are of prognostic significance.

J. A. KENNEDY (Chem. Abstr.).

Determination of Proteins in Spinal Fluid. Ederle, Wilhelm (Staatl. Heilanstalt Weissenau, Wurtt, Ger.). [Deut. med. Wochschr., **74**, 1411-12 (1949).]

A quantitative method is described, based on the xanthoproteic reaction. About 10,000 determinations were carried out by this method over a period of about 14 years. Two ml. of spinal fluid are mixed with 2 ml. of saturated $(\text{NH}_4)_2\text{SO}_4$ in a small test-tube. After at least 2 hours the tube is centrifuged and the supernatant fluid decanted into a second tube. The albumins in the second tube are precipitated with 2 ml. 20 per cent. $\text{CCl}_3\text{CO}_2\text{H}$. After one hour the tube is centrifuged and the supernatant discarded; $\frac{1}{2}$ ml. of 25 per cent. HNO_3 is added to both tubes and kept in a boiling water bath for exactly 5 minutes. The color reaction is carried out with the addition of 0.5 ml. 33 per cent. NaOH and the intensity is measured in a Pulfrich photometer with filter S 43. The results are calculated by comparing them with protein solutions of known concentrations. The globulin fraction is usually too high. The results with this method are within ± 8 per cent., and considered of clinical value. Another method by Roberts is mentioned, which does not require expensive instruments. It is based on Heller's reaction of protein with HNO_3 . The appropriate dilution of the spinal fluid is found which will still show a turbidity when HNO_3 is added. A calibration table is then used for the calculation.

HERTHA H. TAUSSKY (Chem. Abstr.).

Antistreptolysin Content of the Cerebrospinal Fluid. Lundstrom, R., and Von Reis, G. [Am. J. Diseases Children, **79**, 438-41 (1950).]

FELIX SAUNDERS (Chem. Abstr.).

Cholinesterase. III. Specificity of Cholinesterase. Chaudhuri, D. K. (Univ. Coll. Sci. Technol., Calcutta, India). [Ann. Biochem. Exptl. Med., **9**, 67-72 (1949); cf. C. A., **39**, 3799³; **41**, 3829a.]

Evidence is presented to show that cholinesterase isolated from cobra venom by the method of Chaudhuri (C. A., **37**, 1458⁸) is specific for choline esters.

IV. Influence of Temperature and Irradiation on the Activity of Cholinesterase. [Ibid., 73-8.]

Purified cobra venom cholinesterase lost one-half of its activity when exposed to a temperature of 44° for one hour. The effect was irreversible. Heat-inactivated cobra venom protein did not protect the enzyme. Exposure of an aqueous solution of the purified enzyme to ultraviolet rays caused inactivation, increasing in degree with increasing duration of exposure. Na_2SO_4 (5 per cent. solution) afforded considerable protection against the effects of irradiation. Crude cobra venom cholinesterase behaved similarly.

V. Effect of Substrate Concentration and Temperature on the Rate of Hydrolysis. [Ibid., 79-84.]

Purified cobra venom cholinesterase increased in activity with increasing acetylcholine concentration to a maximum at about 0.5 per cent. acetylcholine. Excess substrate up to 1 per cent. caused no inhibition.

VI. Optimum pH and Stability in Relation to pH. [Ibid., 85-90.]

The optimum pH for the activity of either purified or crude cobra venom cholinesterase was 8.4, while maximum stability of the enzyme was found to be in solutions of pH 7.4.

W. DONALD GRAHAM (Chem. Abstr.).

The Cholinesterase of the Pancreas: Its Behavior in Presence of some Inhibitors in Comparison with the Cholinesterases of Serum and Brain. Vincent, D., and Lagreu, R. (Univ. Toulouse, France). [Bull. soc. chim. biol., **31**, 1043-5 (1949).]

The inhibiting action of ibogaine on horse serum cholinesterase (I) is about 40 times as great as on dog pancreatic cholinesterase (II) and sheep brain cholinesterase

(III). Eserine inhibits all three to approximately the same degree. Caffeine inhibits (III), but not (I) and (II). These results show that (II) is distinct from (I) and (III).
L. E. GILSON (Chem. Abstr.).

Inhibition of Rat-brain Cholinesterase by β -Chlorinated Amines. Bain, James A. (Univ. of Illinois, Coll. of Med., Chicago). [Am. J. Physiol., **160**, 187-94 (1950).]

Brain cholinesterase combined with 2 molecules of acetylcholine to form an inactive complex with a dissociation constant of 0.016 M. The structure necessary for inhibitory activity by the β -chlorinated amines was correlated with that necessary for convulsant activity; in both cases the minimum necessary for activity was $\text{CH}_3\text{N}(\text{C}_2\text{H}_4\text{Cl})_2$ or $\text{CH}_3\text{N}(\text{C}_2\text{H}_5)\text{C}_2\text{H}_3\text{Cl}_2$. Strychnine and nicotine were inhibitors of cholinesterase, but metrazole and picrotoxin were not inhibitors. The anticonvulsants, phenobarbital, trimethadione, phenacetylurea, diphenylhydantoin and atropine had no effect on the enzyme, nor did they reverse the effect of any of the inhibitors studied. Inhibition of the enzyme by the β -chlorinated amines was reversed by cysteine. The results are discussed with regard to the mechanism of action of convulsant drugs.
E. D. WALTER (Chem. Abstr.).

Cholinesterases of Cerebrospinal Fluid—Data for Normal Fluids and Fluids from Patients with Syphilis, Meningitis, or Poliomyelitis. Colling, K. G., and Rossiter, R. J. (Univ. Western Ontario, London, Can.). [Can. J. Research, **27E**, 327-40 (1949).]

The true cholinesterase activity increases in the spinal fluid of the syphilitic, while that of pseudocholinesterase increases in fluids of patients with meningitis and polio. There is a correlation of pseudocholinesterase activity with protein concentration and less with cell count.
J. S. WARAYDEKAR (Chem. Abstr.).

Investigations into Cholinesterase Levels in Serum and Cerebrospinal Fluid of Psychotic Patients. Early, D. F., Hemphill, R. E., Reiss, M., and Brummel, E. (Mental Hosp., Bristol, Eng.). [Biochem. J., **45**, 552-6 (1949).]

The true cholinesterase value of the serum in 55 psychotic males (59-85 years) was within normal range in 56 per cent., high in 24 per cent., and below normal in 20 per cent., and among 16 mental defectives 94 per cent. had normal values. No correlation could be found between true and pseudocholinesterase values, or between serum and cerebrospinal-fluid values. Only after repeated electroconvulsive shocks was the serum cholinesterase level lowered, but 1 to 90 minutes following such treatment the cholinesterase level may go down or up, or remain unchanged.
S. MORGULIS (Chem. Abstr.).

Serum Cholinesterase and Functional Cardiac Neurovegetative Disorders. Merlen, J. F. (Faculty Med., Lille, France). [Ann. Biol. clin. (Paris), **7**, 429-44 (1949).]

Normal serum cholinesterase values were found in a large majority of patients showing various cardiac and related disorders.

FRED. H. SNYDER (Chem. Abstr.).

Electrophysiological Analysis of Action of Acetylcholine on Nerve Centers. I. Artem'ev, V. V., and Bab'skii, E. B. (Moscow State Pedagog. Inst.). [Fiziol. Zhur. (J. Physiol.), **35**, 623-30 (1949).]

Application of acetylcholine (concentration 10^{-8} to 10^{-4}) to the visual lobes of the frog, without eserine, causes a variable and temporary increase of electrical activity. At 10^{-8} to 5×10^{-8} concentration combined with 2.5×10^{-6} concentration of eserine a considerable and lasting enhancement of spontaneous electrical oscillations takes place, with large amplitudes of both slow and fast oscillations. Eserinized acetylcholine solutions of higher than 10^{-6} concentration repress electrical activity of nerve centers. Hence acetylcholine appears to act in the regulation of the state of central nervous stimulation.

G. M. KOSOLAPOFF (Chem. Abstr.).

The Use of Acetylcholine in the Objective Determination of Circulation Time in Man. Schlichter, Jakub G., Wilburne, Morris, and Grossman, Milton (Michael Reese Hosp., Chicago). [*Am. J. Med. Sci.*, **216**, 523-7 (1948).]

The rapid injection of 0.2-1.2 c.c. of a 5 per cent. solution of acetylcholine chloride (10-60 mgm.) afforded a simple, accurate and objective measurement of circulation time in man, according to tests on 37 patients. The end-point of the determination was the time an expected auricular or ventricular response on the continuous electrocardiogram failed to occur on time. However, a serious hazard of such an injection is the induction of multiple premature extra-systoles and auricular fibrillation. The latter was observed in 2 cases of the present series; in these, sinus rhythm was re-established by oral administration of quinidine. The margin of safety of the compound may be small; in one case 20 mgm. acetylcholine had no effect on the patient, while 25 mgm. produced asystole followed by auricular fibrillation.

M. H. P. (Chem. Abstr.).

Acetylcholine Release at Parasympathetic Synapses. Emmelin, Nils, and Muren, Anders (Univ. Lund, Sweden). [*Acta Physiol. Scand.*, **20**, 13-32 (1950).]

The submaxillary gland of cats was perfused with eserized plasma. The perfusate was tested for acetylcholine by cat's blood pressure. Stimulation of the chorda tympani caused an increase in acetylcholine content, though small amounts of acetylcholine were always present in the venous outflow. In the presence of curare (10^{-4} intocostarin) stimulation of the chorda tympani produced only about $\frac{1}{3}$ - $\frac{1}{4}$ of the acetylcholine output as was obtained without curare. The average output of acetylcholine was 0.144 γ without curare, and only 0.05 γ with curare. It is assumed that curare prevents transmission of nerve impulses across the synapses in the parasympathetic submaxillary ganglion, as it does in the superior cervical ganglion, but without interfering with the release of transmitter substance from the preganglionic endings of the chorda tympani. This idea is further supported by the pharmacological evidence, and by the fact that the chorda tympani contains a relatively high concentration of acetylcholine.

S. MORGULIS (Chem. Abstr.).

The Mechanism and Significance of the Convulsing Action of Acetylcholine. Ardini, A., and Machne, X. (Univ. Parma, Italy). [*Boll. soc. ital. biol. sper.*, **24**, 884-5 (1948).]

Masticatory epilepsy and Jacksonian movements were observed in rabbits after application to the masticatory cortical area of 4-10 per cent. solutions of acetylcholine (I), or of 1 per cent. eserine (II), followed by 1 per cent. (I), or of 2-3 per cent. (II). Intravenous injection of 1-3 mgm./kgm. adrenaline (III) inhibited the Jacksonian movement thus produced, but did not counteract the effect of 20 per cent. (I). (III) had no effect on epilepsy produced by Amantea's method of strychninization when applied locally, but inhibited in 0.2 per cent. local application the Jacksonian mastication produced by (I). The convulsing action of (I) is not an osmotic effect, but is caused by the ester in concentrations much higher than the physiological ones.

F. FROMM (Chem. Abstr.).

Experimental, Comparative, and Clinical Investigations of the Action of Amidopyrine, with Special Consideration of Nervous Reactions. Nitsch, Kurt (Univ. Göttingen, Ger.). [*Z. Kinderheilk.*, **67**, 366-422 (1949).]

An extensive review and numerous original experiments on the effect of amidopyrine are presented. It possesses a regulative action on capillary permeability and exerts its influence via the nervous system. Its action on the water balance, body temperature, blood sugar, serum-iron level and blood-cell level, when administered intravenously, are described. In clinical observations it was found to possess a regulative action in disturbances involving the sympathetic and parasympathetic nervous system. Its influence on bronchial asthma, migraine and rheumatic fever are discussed in the light of the experimental observations.

D. L. NOETHER (Chem. Abstr.).

Effect of Parpanit on Brain Wave Changes Induced by Diisopropyl Fluorophosphate. Essig, C. F., Hampson, J. L., Bales, P. D., Willis, Alice, and Himwich, H. E. (Army Chem. Center, Md.). [*Science*, **111**, 38-9 (1950).]

Parpanit (2-diethylaminoethyl 1-phenylcyclopentanecarboxylate) effectively abolished the *grand mal*-like patterns produced by diisopropyl fluorophosphate (D.F.P.). Monopolar corticograms from each side of the brain of albino rabbits and an electrocardiogram (I) were recorded simultaneously on a four-channel Grass apparatus. D.F.P. (1 mgm./ml. in distilled H₂O) was injected into one carotid artery at 12-minute intervals in doses of 0.5 mgm./kgm. From 2 to 3 doses were required to produce bilateral *grand mal*-like patterns on the electroencephalogram (II). Parpanit in doses of 2-4 mgm./kgm. was then given intravenously. All spiking ceased within 3-4 minutes, and was supplanted by patterns characterized either by delta-like waves or somewhat low potential aperiodic activity, resembling the control (II). Although parpanit abolished the abnormal (II) activity, the cholinesterase levels of both cerebral cortexes and right mid-brain remained depressed. The influence of parpanit on the heart was manifested in those instances where the cholinergic action of D.F.P. produced bradycardia and altered (I) patterns concomitantly with convulsive-type (II) records. Parpanit appears capable of restoring such (I) records to normal pattern and rate.

WESLEY H. HARTUNG (Chem. Abstr.).

The Affinity of the Nerve Fiber for Tetanus Toxin. Roofe, Paul G. (Univ. of Kansas, Lawrence). [*J. Kansas Med. Soc.*, **49**, 60-1 (1948).]

In one group of guinea-pigs the sciatic nerves were exposed near the knee-joint and tetanus toxin placed on the central cut ends of the nerves. In 72 hours all the animals were dead of tetanus. In a second group the sciatic nerve was exposed and frozen with CO₂ snow to degenerate the axis cylinder. After 16 days toxin was applied as with the first group. None of the animals developed tetanus. The toxin was found to travel at an average of 3.35 mm./hr. along the nerve fiber.

E. K. WEISBURGER (Chem. Abstr.).

Effect of Stimulation on the Phosphate Esters of the Brain. Dawson, R. M. C., and Richter, D. (Whitchurch Hosp., Cardiff, S. Wales). [*Am. J. Physiol.*, **160**, 203-11 (1950); cf. *C. A.*, **43**, 745h.]

Electric stimulation of the rat brain produces a rapid fall in the phosphocreatine level, and a corresponding transient rise in the hexose phosphate fraction. The initial changes are followed by the return of the hexose phosphate fraction to the normal level, accompanied by the liberation of inorganic phosphate. These changes are evident in brains fixed up to 10 seconds after electric stimulation, and occur before the onset of convulsions. Brains fixed at 15 to 45 seconds after stimulation show a return of the phosphocreatine and of the phosphate level to normal. The adenosine triphosphate fraction shows only a slight fall after stimulation, with a return to normal after 25 seconds. The brains of rats taken during emotional excitement give a mean phosphocreatine level 13 per cent. higher than that of normal controls. There is no significant change in the other phosphate esters.

E. D. WALTER (Chem. Abstr.).

Reversibly Depressive Action of Steroid Hormones on the Central Nervous System. Hofmann, H. (Univ., Jena, Ger.). [*Endokrinologie*, **26**, 57-60 (1949).]

Desoxycorticosterone acetate, testosterone propionate, progesterone, and estradiol benzoate have no anesthetic effect on the central nervous system (mice, rats), even in large doses. Of the generally used solvents, propylene glycol has anesthetic action.

S. MORGULIS (Chem. Abstr.).

Histamine as a Specific Constituent of Certain Autonomic Nerve Fibers. Euler, U. S. v. (Karolinska Inst., Stockholm). [*Acta Physiol. Scand.*, **19**, 85-93 (1949).]

The highest amounts of histamine (60-100 γ histamine dihydrochloride per gm.) are found in nerves containing post-ganglionic sympathetic nerves (adrenergic fibers) like the splenic, splanchnic or mesenteric nerves, whereas the smallest amounts are found in spinal roots and central nervous system, and intermediate

amounts are found in preganglionic autonomic fibers. Although nerves rich in histamine are also rich in noradrenaline, no definite correlation can be established. However, the large proportion of histamine to noradrenaline in such nerves as the mesenteric or cephalic postganglionic sympathetic fibers suggests that these fibers may have some relation to secretory function like the nerves supplying digestive glands, or to the smooth muscles. Liberation of histamine may serve to activate peripheral structures, and the nerve fibers promoting this may be true histaminergic nerves. The fact that the histamine-rich myelinated fibers of the splenic nerves belong to the C fiber class suggests that perhaps the histaminergic fibers are all of this kind.

S. MORGULIS (Chem. Abstr.).

Distribution of Sympathin N and Sympathin A in Spleen and Splenic Nerves of Cattle. Euler, U. S. v. (Karolinska Inst., Stockholm). [*Acta Physiol. Scand.*, **19**, 207-14 (1949).]

Small but measurable quantities of adrenaline are found in adrenergic nerves, together with noradrenaline, indicating that both biologically different substances acting as nerve transmitters in adrenergic nerves are formed in the nerve itself. The sympathin formed in the adrenergic nerves of the spleen (cattle) is noradrenaline. The small amounts of adrenaline are formed by methylation of noradrenaline. The splenic nerves contain, on the average, 2.2 per cent. adrenaline, which is very much less than the 7.2 per cent. contained in spleen extracts.

S. MORGULIS (Chem. Abstr.).

Neuroregulation of the Ovaries. Emanuel, Rainer (Univ.-Frauenklinik, Bern, Switz.). [*Z. Geburtshilfe u. Gynakol.*, **124**, 44-58 (1942).]

Injection of acetylcholine or pilocarpine shortened the ovarian cycle of growing female rats, while adrenaline and atropine lengthened the cycle. In old female rats the sexual cycle was renewed by one injection of pilocarpine, while in castrated female rats pilocarpine alone, or with below-threshold doses of follicular hormone, did not renew the cycle. Pilocarpine did not bring about ovarian function in immature rats.

E. K. WEISBURGER (Chem. Abstr.).

Action of Sympathomimetic Amines on the Central Nervous System and the Blood Sugar; Relation of Chemical Structure to the Mechanism of Action. Leimdorfer, Alfred (Loyola Univ., Chicago). [*J. Pharmacol. Exptl. Therap.*, **98**, 62-71 (1950); cf. *C. A.*, **43**, 6744b.]

Effects of intracisternal injection of sympathomimetic amines in dogs were investigated. Adrenaline, N-isopropylarterenol, l-arterenol and butanephrene exhibited an analgesic, anesthetic, and hypnotic action and induced hyperglycemia. Adrenaline showed the most prolonged action, and also stimulated the respiratory center without change in blood pressure or electrocardiogram; the other three affected both blood pressure and heart action. Synephrine produced short-lasting sedation, and neosynephrine provoked excitement. Both caused an increase in blood sugar for a short time, and raised the blood pressure and disturbed the heart action. Ephedrine, benzedrine and propadrine produced no analgesia, no anesthesia, no sleep, and no change in blood sugar. They produced great excitement and severe disturbances in the electrocardiogram. The 2-aminoheptanes (tuamine and oenethyl) induced no anesthesia but caused very marked excitement, stimulation of motor areas of the cerebral cortex, and large increase in blood pressure, with little or no change in blood sugar. The relation between structure and activities is discussed, as well as the possibility of intrathecal injection of adrenaline as an aid in spinal anesthesia.

L. E. GILSON (Chem. Abstr.).

Effect of Methadon Isomers on the Respiration of Rat Brain Homogenates. Watts, Daniel T. (Univ. of Virginia Med. School, Charlottesville). [*Arch. Biochem.*, **25**, 201-7 (1950).]

The oxidation of glucose, succinate, or ascorbate by rat brain homogenate was inhibited by 0.003-0.007 M. methadon (I), and slightly more by isomethadon. For (I) the variation of inhibition with concentration was the same for all three substrates, and anaerobic glycolysis was protected rather than inhibited. That

the latter effect might be due to inhibition of some autolytic enzyme, such as diphosphopyridine nucleotidase, could not be shown. The *l*- and *d*- forms of the two drugs inhibited to a similar degree.

MARSHALL E. DEUTSCH (Chem. Abstr.).

An Approach to the Solution of Mental Dysfunction Through Brain Enzyme Studies. Ashby, Winifred (St. Elizabeth's Hosp., Washington, D.C.). [Am. J. Psychiat., **106**, 491-96 (1950).]

Discussion with a summary of Ashby's work on carbonic anhydrase in brain (C. A., **42**, 3827f, 5105h; **43**, 4747d). WARREN M. SPERRY (Chem. Abstr.).

Effect of Insulin Hypoglycemia on Brain Glutamate. Dawson, R. M. C. (Whitchurch Hosp., Cardiff, Wales). [Nature, **164**, 1097 (1949).]

Insulin hypoglycemia produced a significant decrease in the level of L-glutamic acid in rat brain; the extent of decrease depended on the severity of the hypoglycemia. In deep coma the level was 100 mgm. per cent. compared with the control value 148 = 8 mgm. per cent. At the same time there appeared to be a slight rise in the glutamine level. These observations suggest that in hypoglycemic emergency the brain is able to obtain energy by metabolizing its glutamic acid reserves.

B. W. (Chem. Abstr.).

Water Economy in Epilepsy. Weinland, Wolf L. (Anstalt Bethel, Bielefeld, Ger.). [Arch. Psychiat. Nervenkrankh., **183**, 402-17 (1949).]

There was no relation between daily variations in body weight and occurrence of seizures in 18 epileptics. As a test procedure 800 ml. of warm tea was given early in the morning, and the rate of urine secretion was determined during the following 24 hours with bed rest, fasting, and no fluid intake. In 25 epileptics the total excretion was usually normal 2 days before or after seizures, but there was more hour-to-hour variation than in normals. When a spontaneous seizure occurred at the beginning of an experiment it did not affect the excretion of urine, but when it occurred during an experiment it was preceded and followed by an inhibition of excretion.

WARREN M. SPERRY (Chem. Abstr.).

Studies of the Adrenals of Genuine Epileptics, with Particular Attention to the Cholesterol Content. Wendt, G. Gerhard (Anstalt Bethel, Bielefeld, Ger.). [Arch. Psychiat. Nervenkrankh., **183**, 418-22 (1949).]

Analysis of the adrenals from 9 epileptics and 12 non-epileptics, who had died of various diseases, showed that the average wet weight, dry weight, ether extract, EtOH extract, and cholesterol (I) content were all higher in the epileptics than in the controls. The differences for (I) was about 300 per cent. and was statistically significant.

WARREN M. SPERRY (Chem. Abstr.).

Cytochrome and Cytochrome Oxidase in Multiple Sclerosis. Huzák, I. (Univ. Szeged, Hung.). [Confinia Neurol., **10**, 104-7 (1949).]

Cytochrome- or indophenol oxidase (I) was determined spectroscopically in brain slices treated with dimethyl-p-phenylenediamine. Whereas no (I) was found in white matter from normal brains, it was present in sclerotic plaques, both in white and gray matter, from persons with multiple sclerosis.

WARREN M. SPERRY (Chem. Abstr.).

The Adrenaline Picture of the Blood in Electroshock. Hann, Joseph, and Kinzius, Hansjörg (Max Planck Inst. Arbeitsphysiol., Dortmund, Ger.). [Deut. Z. Nervenheilk., **163**, 82-92 (1949).]

Adrenaline (I) was determined in the blood before and at frequent intervals after electroshock (II) in schizophrenic patients, dogs, rabbits, and rats. (I) concentration usually dropped immediately after (II), and then rose above the original concentration about 5 minutes after (II).

WARREN M. SPERRY (Chem. Abstr.).

The Effect of Bilirubin on the Pathogenesis of Brain Injury in Erythroblastosis Fetalis. Kuster, Fritz, and Krings, Heinz (Med. Akad., Dusseldorf, Ger.). [Z. Kinderheilk., **67**, 503-16 (1950).]

In rabbits, blood containing a bilirubin concentration of 100 mgm. per cent. causes fatal brain injury. Increased capillary permeability in human nuclear icterus makes bilirubin, in lower concentrations, a fatal poison.

D. L. N. (Chem. Abstr.).

Histochemistry of Lipides in Destructive Processes of Central Nervous System. Hominskii, B. S. [Ark. Patol. S.S.S.R., **9**, No. 5, 35-45 (1947).]

A histochemical study was made of 10 cases of Wallerian degeneration of the spinal cord and cerebrum resulting from compression due to tumors or trauma; similar data were obtained in 2 cases each of tabes dorsalis, ergotism, and amyotrophic lateral sclerosis, and in 4 cases of multiple sclerosis with numerous foci in the cerebrum and spinal cord. A new term, "destructive-resorptive steatosis," is suggested to characterize the destruction of nervous tissue and the transformation of lipide substances in the bodies of glial cells. The process is described in six consecutive stages; it is mainly characterized as cholesterol ester fatty degeneration. In the early stages a splitting up of the glycerophosphatides occurs; other phosphatides and cerebrosides are disintegrated in the later stages.

B. A. (Chem. Abstr.).

Psychophysical Correlations. VII. Adjuvant Therapy of the Liver in Schizophrenia. Fischer, Roland, Georgi, F., Weber, Rolf, and Piaget, R. M. (Psychiatric Univ. Clinic, Basle, Switz.). [Schweiz. med. Wochschr., **80**, 129-35 (1950).]

Liver dysfunction was determined by the Quick test as a diminution of hippuric acid excretion. The liver damage is considered reversible in character, because in spontaneous remissions as well as in remissions after specific treatment of schizophrenics the dysfunction disappeared. Specific adjuvant therapy consisted of 2 gm. methionine, 1.5 gm. choline, 1 gm. inositol, 50 gm. glucose, and 6 tablets of cobezym daily. The diet was high in protein and carbohydrates and low in fat (maximum 60 gm. per day).

E. MAIER (Chem. Abstr.).

New Findings in the Brains of Victims of Methanol Poisoning. Orthner, Hans (Göttingen, Ger.). [Zentr. allgem. Path. u. path. Anat., **85**, 11-16 (1949).]

Individuals poisoned by MeOH exhibited necrotic foci restricted to the putamen in the brain. The lesions were characteristic, and their size was proportional to the time of survival after intake of MeOH. The liver showed signs of a serous exudation.

J. H. WEISBURGER (Chem. Abstr.).

Lead Encephalopathy: Treatment and Recovery. Binder, Israel (Women's Homeopathic Hosp., Philadelphia, Pa.). [Arch. Pediatrics, **67**, 51-5 (1950).]

Pb poisoning in a child 3 years old was due to chewing crayons; it was characterized by basophilic stippling of the erythrocytes, the Pb line in the long bones on X-ray examination, blood Ca 7.3 mgm./100 c.c., and spinal fluid with increased pressure and containing 74 mgm. sugar, 730 mgm. chlorides/100 c.c. with no increase in protein. Treatment was directed at storage of the Pb in the bones by administration of Ca gluconate and vitamins C and D.

JOSEPH S. HEPBURN (Chem. Abstr.).

The Connective Tissue Sheath of the Nerve as Effective Diffusion Barrier. Feng, T. P., and Liu, Y. M. (Acad. Sinica, Shanghai). [J. Cellular Comp. Physiol., **34**, 1-16 (1949).]

Study of depolarization and action potentials of intact and sheathless toad and frog nerves confirmed the conclusion (Proc. Exptl. Biol. Med., **27**, 1073 (1930)) that the sheath is an effective diffusion barrier, and that the greatly increased rate of action of various kinds of solutions on the sheathless nerve must result essentially from removal of this barrier. The sheath could not be imitated by a coat of gelatin, even with a thickness greater than that of the sheath. Even though the sheath is an effective diffusion barrier, hemoglobin escaped through the sheath under pressure of a few cm. of H₂O.

H. L. M. (Chem. Abstr.).

Biochemical Development of the Brain of the Chick Embryo. I. Nucleic Acids. Mandel, P., Bieth, R., and Stoll, R. (Univ. Strasbourg, France). [Bull. soc. chim. biol., **31**, 1335-40 (1949).]

L. E. GILSON (Chem. Abstr.).

The Statistical Organization of Nervous Activity. McCulloch, Warren S., and Pitts, Walter. [Biometrics, **4**, 91-9 (1948).]

It is demonstrated mathematically that the actions of neurons and their mutual relations can be described by the calculus of propositions subscripted for time; that the nervous system as a whole is ordered and operated on statistical principles, thereby adjusting the all-or-none laws governing its elements to a physical world of continuous variation; that the nervous system detects universals; that the nervous system conserves its own level of activity, the condition of the body it inhabits, and its relation to the physical world, by activity in closed paths, such that a change in its output causes a change of opposite sign in its input; that it chooses between ends; that it alters its structure by experience.

(Psychol. Abstr.)

2. Pharmacology and Treatment.

Action of Narcotics on the Metabolism of Brain. Rosenberg, Albert J., Buchel, Leya, Etlng, Nicole, and Levy, Jeanne. [Compt. rend., **230**, 480-2 (1950).]

The effects of several drugs on the metabolism of rat brain slices and homogenate were studied in the Warburg apparatus. To obtain a 50 per cent. inhibition of O uptake, 1.5 mgm. of chloral, 0.9 mgm. of gardenal, 0.6 mgm. of chloretone, or 0.3 mgm. of soneryl per ml. of medium were required. These values correspond to the relative physiological activities of the drugs. Along with the depressed respiration were found increases in glucose consumption and in lactic acid production. These results were interpreted as indicating that the drugs studied acted as inhibitors of the Pasteur effect.

W. D. GRAHAM (Chem. Abstr.).

The Influence of Calcium and Parathormone on the Sensitivity of Narcotic and Convulsive Poisons. Haas, H. T. A., and Kraushaar-Baldauf, E. (Univ. Bonn, Ger.). [Arch. klin. Chir., **260**, 641-55 (1948).]

One to 9 mgm. Ca gluconate per 100 gm. body-weight given subcutaneously or orally to rats has a protective action against procaine and pontocaine. Ca is antagonistic to pontocaine in mice. The average lethal dose of pontocaine is higher if the drug is administered perorally than subcutaneously. Intraperitoneal injections of 0.25, 0.5 and 1 c.c. parathormone per 100 gm. body weight protect rats against procaine and pontocaine. No protection with parathormone and Ca is obtained in cases in which cardiazole, strychnine, avertin and evipan were given subcutaneously. In diuresis experiments in rats parathormone does not alter urinary excretion. Ca has an enhancing effect during the first few hours after subcutaneous administration.

GERTRUDE E. PERLMANN (Chem. Abstr.).

Quantitative Investigations on the Antagonism of Picrotoxin and Barbitol Sodium on Rabbits. Jarvinen, P. A., and Vartiainen, A. (Univ. Helsinki, Finland). [Ann. Med. Exptl. et Biol. Fenniae, **27**, 78-86 (1949) (in English).]

Rabbits were anesthetized with 0.2-1.0 gm./kgm. doses of barbitol sodium. The quantitative results are tabulated, and show that 0.9-43.7 mgm./kgm. picrotoxin in 1-13.3 intravenous injections were needed for the final awakening of the animals. Picrotoxin treatment decreases the anesthetic mortality, shortens the duration of anesthesia and increases the lethal dose of barbitol sodium.

D. L. NOETHER (Chem. Abstr.).

Convulsions in Cerebellum and Cerebrum Induced by β -Chlorinated Amines. Pollock, Geo. H., and Bain, James A. (Univ. of Illinois, Coll. of Med., Chicago). [Am. J. Physiol., **160**, 195-202 (1950); cf. preceding abstr.]

The convulsant activity of 25 β -chlorinated amines was studied in cats. The threshold dose is approximately halved, and the time of seizure greatly reduced by inhalation of gas mixtures containing 15-30 per cent. CO₂. Seizure discharge was first observed in the cerebellar leads.

E. D. WALTER (Chem. Abstr.).

Respiration of Brain Cells under the Influence of Hypnotics. Influence of Alkalosis. Buchel, Leya. [Compt. rend. soc. biol., **143**, 613-15 (1949).]

The inhibiting action of EtOH, chloral hydrate, and several barbiturates on O consumption of brain slices was considerably weaker at pH 8.4 than at pH 7.
L. E. GILSON (Chem. Abstr.).

Absence of Localization of Barbitol in Divisions of the Central Nervous System. Maynert, E. W., and Van Dyke, H. B. (Columbia Univ.). [J. Pharmacol. Exptl. Therap., **98**, 184-7 (1950).]

An isotope dilution experiment with the urine from a dog after ingestion of barbitol labelled with N¹⁵ confirmed the view that barbitol does not undergo any change *in vivo*. Hence the determination of excess N¹⁵ extracted from tissues is equivalent to the determination of barbitol. The concentration of isotopic barbitol was determined in various parts of the brain of 4 dogs after doses of 25-250 mgm./kgm. No localization in any particular division of the central nervous system such as the diencephalon (as suggested by other investigators) was detected.

L. E. GILSON (Chem. Abstr.).

Synergism Between Narcotics and Myanesin. Levi, A. (Univ. Modena, Italy). [Giorn. ital. anesthesiol., **15**, 79-84 (1949).]

Myanesin (α , β -dihydroxy- γ -(methylphenoxy)-propane) (I) in small, non-myolytic doses increases the activity, especially of the thiobarbiturates, pentothal and thionarcon, and to a less extent barbitol, phenobarbitol, evipan, morphine, amidone, chloral, urethan, NaBr, ether, and CHCl₃ in dogs and rabbits. When the narcotic and (I) were injected at the same time, synergism was noted even at inactive, but determined, doses of the narcotic. When (I) was injected on awakening from the narcotic sleep the animal fell again into a profound sleep, sometimes of greater duration than the one due to first narcotic action.

M. ELLIOTT (Chem. Abstr.).

Chemical Constitution and Nerve Action. II. Gabelein, Klaus (Paulsdorfferstr. 9, Munich, Ger.). [Med. Monatsschr., **4**, 130-3 (1950); cf. *ibid.*, **3**, 619 (1949).]

An attempt is made at explaining the effect on sensory organs (taste, smell) as well as the pharmacological action on nerve function of compounds on the basis of their valence deformation.

A. E. MEYER (Chem. Abstr.).

Effect of Strychnine on the Cat Electroencephalogram. Johnson, Herbert C., Browne, Kenneth M., Markham, James W., and Walker, A. Earl (Johns Hopkins Univ., Baltimore, Md.). [Proc. Soc. Exptl. Biol. Med., **73**, 97-9 (1950).]

L. E. GILSON (Chem. Abstr.).

Effect of some Drugs on the Polarization State of Spinal Cord Elements. Van Harreveld, A., and Feigen, Geo. A. (California Inst. of Technol., Pasadena). [Am. J. Physiol., **160**, 451-61 (1950); cf. C. A., **43**, 9260b.]

Et₂O, Na pentobarbital, dial, pentothal, avertin, and CHCl₃ caused a uniform depolarization of the spinal neuron. Chloral seems to depolarize the nerve cell more than the fibers. The anticonvulsants, dilantin and mesantoin, produced considerable uniform depolarization in doses which did not affect the knee-jerk and flexion reflex. Cocaine produced a uniform depolarization. Morphine and strychnine did not depolarize the spinal cord elements. The strychnine convulsions, however, produce a functional depolarization. Na 1, 3-dimethylbutyl-ethylbarbiturate probably caused functional depolarization owing to the convulsive discharges, but in higher concentrations depolarization like the narcotic barbiturates.

E. D. WALTER (Chem. Abstr.).

Action of Picrotoxin and Paraldehyde on Cerebral Excitability. Fernandez, Elvira de Echalecu (Facultad. med., Madrid). [Farmacoterap. actual (Madrid), **6**, 140-2 (1949).]

Intravenous picrotoxin lowers the threshold of excitability in dogs with electrodes permanently fixed to the cerebral cortex. Electric stimuli, normally ineffective, cause a variety of motor reactions. Paraldehyde has the opposite effect.

A. E. MEYER (Chem. Abstr.).

Influence of Certain Neurotropic Substances on Central and Synaptic Transmission in Callianassa. Turner, R. S., Hagins, W. A., and Moore, A. R. (Stanford Univ., Stanford, Calif.). [*Proc. Soc. Exptl. Biol. Med.*, **73**, 156-8 (1950).]

Eserine and atropine produced a marked increase in the "spontaneous" activity of the ganglion cells when applied to the exposed ventral nerve cord of the macrurous anomuran crustacean *Callianassa californiensis*. These drugs had no appreciable effect on conduction characteristics of the giant fibers in the nerve cord, on the transmission across the synapse between the giant fibers and the nerves to the flexors of the telson, or on denervated muscle. Nicotine, methylamine, triethylamine, and diisopropyl fluophosphate reversibly block synaptic transmission for varying periods of time. L. E. GILSON (Chem. Abstr.).

Quantitative Studies on the Autonomic Actions of Curare. Guyton, Arthur C., and Reeder, Robert C. (Univ. of Mississippi). [*J. Pharmacol. Exptl. Therap.*, **98**, 188-93 (1950); cf. *C. A.*, **44**, 2116f.]

The relative amounts of curare required to paralyze various sympathetic and parasympathetic functions in the dog were determined. In all cases the doses were considerably higher than those producing skeletal nerve paralysis.

L. E. GILSON (Chem. Abstr.).

Pentothal and Curare for the Modification of Electric Convulsions. Rising, Jesse D. (Univ. of Kansas Med. School, Kansas City). [*J. Kansas Med. Soc.*, **48**, 456-8 (1947).]

In dogs intravenous doses of pentothal up to 15 mgm./kgm. elevated moderately the convulsive threshold after electric shock, while 20 mgm./kgm. prevented convulsive seizures. Pentothal reduced the period of apnea and reduced or eliminated post-shock excitement. Curare in doses of less than 1 unit/kgm. was not reliable to lessen convulsions, and larger doses produced severe depression of respiration with prolonged apnea. A combination of 0.5 unit of curare/kgm. and 10 mgm./kgm. of pentothal lessened convulsions and reduced apnea and post-shock excitement.

E. K. WEISBURGER (Chem. Abstr.).

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The following names are printed in SMALL CAPITALS: Authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name, thus: "Psychoanalysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.)."

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